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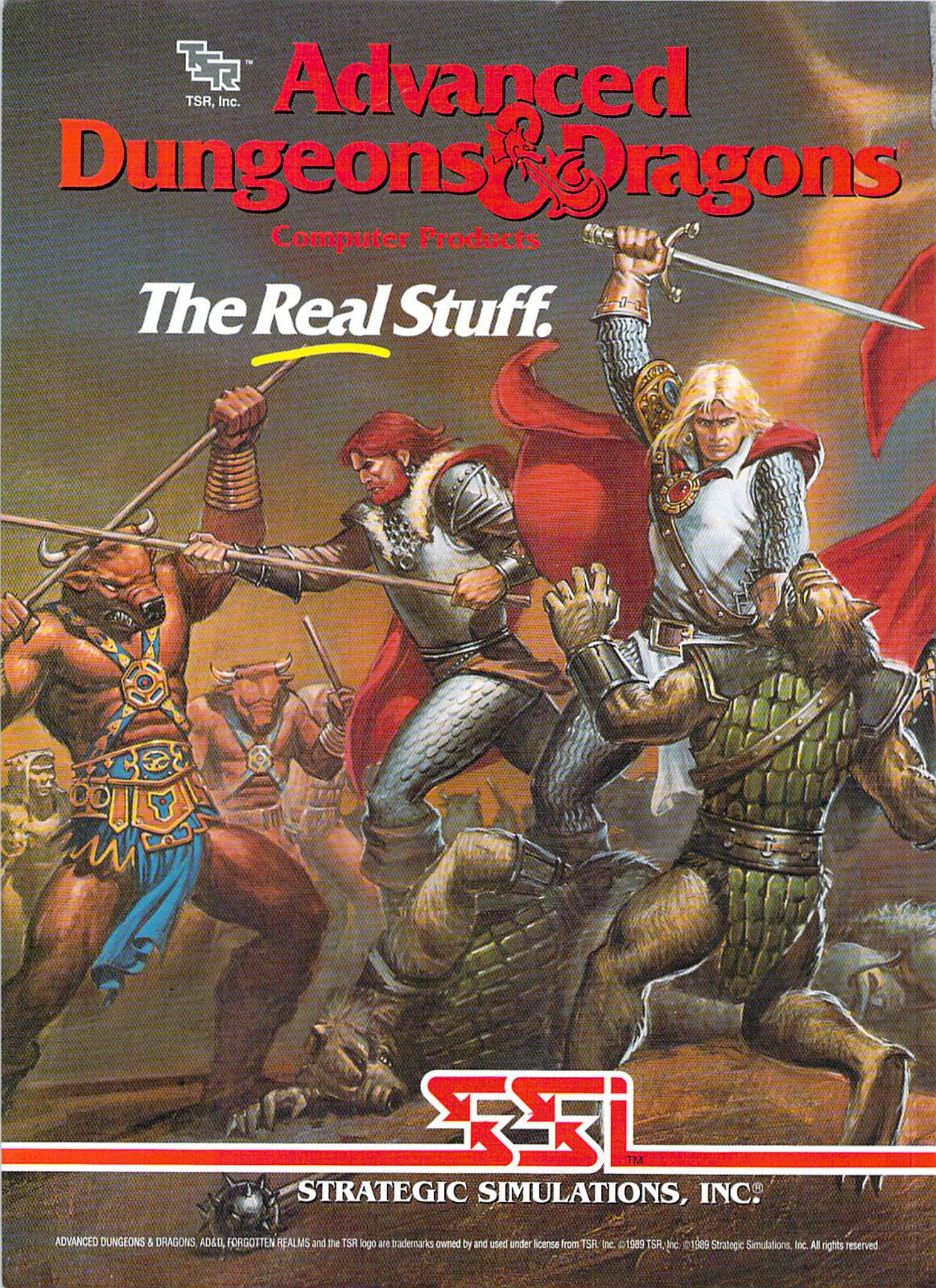

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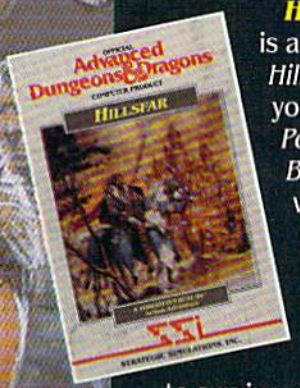

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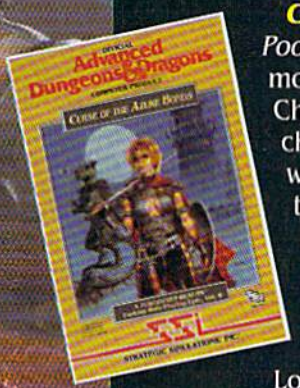

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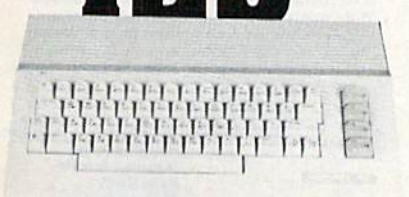

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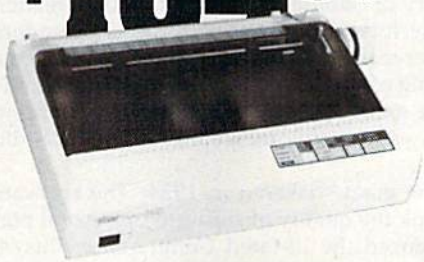

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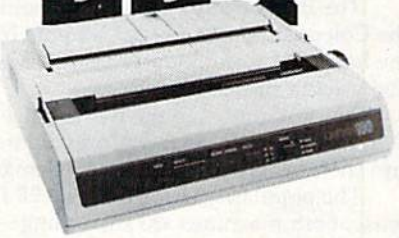

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EDITOR'S notes

This issue marks the sixth anniversary of *Gazette*. If you're a longtime reader, you have a good sense of the topsy-turvy history of both the Commodore market and the general personal computer market. The past six years have been a virtual roller-coaster ride. Back in the spring of 1983, when we debuted *Gazette*, the Commodore 64 was the hottest machine going. Anyone who wrote anything in BASIC was suddenly a software vendor—and many unexceptional products did very well because of the great demand.

Software sales went berserk until the great shakeout in 1984. The software publishers who survived the shakeout took the quality of software up several plateaus. Also in 1984, Commodore introduced the ill-fated Commodore Plus/4, which some say was the intended legacy of the freshly departed and embittered Commodore CEO, Jack Tramiel.

The Plus/4 and 16 weren't the only hardware flops in 1984–1985. Remember the Coleco Adam, the TI-99, and the IBM PCjr? One machine rose, however, from the heap: the Commodore 128. Like its younger cousin, the 64, it showed continued growth into 1987.

Despite rumors of the 64's demise in 1986 and 1987, it continued to sell well. During these years, in fact, Commodore several times stopped production of the 64 and then restarted it because of demand.

The popularity of the 64 and 128 finally tapered off beginning in 1987. In one sense, both machines are still strong—who can argue with such a huge installed base?—but they've been hurt in recent years by a number of surprising competitors. Who could have predicted the huge swell in sales of MS-DOS machines or the tidal-wave surge of Nintendo? The newer technologies and allure of Apple's Macintosh and Commodore's own Amiga also provided appealing alternatives to the user and programmer.

The 64 and 128 have been solid and surprising contenders in the personal computer market despite all that's worked against their continued success—and despite Commodore. To trace the history of leadership at Commodore is a quick study of the workings of the revolving door. If you've been with us for a while, you might remember the names of many departed Commodore execs which have appeared in these pages: Jack Tramiel, Marshall Smith, Thomas Rattigan, and Nigel Shepherd, to name a few. We learned in early April that Rich McIntyre, a key Commodore figure (interviewed in a 1988 *Gazette*) had departed. And then, in late April, we were very much surprised to hear that Max Toy, Commodore's president and chief operating officer of U.S. operations, had resigned (we had spoken with Toy at the Spring COMDEX Commodore booth less than two weeks before his resignation). Toy had come to Commodore 18 months earlier with high hopes and great expectations on the part of CEO Irving Gould. Gould wasted no time in naming a replacement. Harold Copperman replaced Toy on April 24, the day of Toy's official resignation. Copperman, 42, is the former vice president and general manager of Eastern Operations for Apple Computer. Prior to that, he served for 20 years with IBM.

The U.S. market, unlike that of Europe, has been stagnant for Commodore, and it's a good guess that Gould's patience was wearing thin. So what will be expected of Copperman? Mehdi Ali, president of Commodore International, stated, "We want to make further forays into education and business," which says to us that Commodore wants the Amiga to be taken seriously in the schools and in the office. The 64 and 128 are not focal points in Commodore's plans.

In the past six years, Commodore, like the entire personal computer industry, has been unpredictable and erratic. Nevertheless, there's always been excitement—and a lot of surprises. There's never a dull moment.

Whatever Commodore's plans, be assured that *Gazette* will continue to enthusiastically support the 64 and 128.

Lance Elko

Lance Elko
Senior Editor

COMPUTE!'s GAZETTE FOR USERS
COMMODORE 64/128

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LETTERS to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

Mystery Solved

In response to "Missing in Canada" (May), I have an answer. *Traitex 64/128* is now published by Logibec Groupe Informatique, who markets the product under a different corporate name, Logiciel Tanda. The address is

Logiciel Tanda
1, Place du Commerce
Bureau 410
Ile des Soeurs
Quebec, Canada H3E 1A2

Gilles Bernier
Gatineau, Quebec

A special thanks for your detective work, Gilles.

Marauding by Mail

Members of our user group have reported that they have written to several user groups (listed by you and by other magazines) that appeared to be general groups serving more than a local area. In many cases, they found that some of these "user groups" are an individual who is in the business of selling software, often pirated. Other groups turned out to be devoted to trading software, much of it pirated. You might want to address this by including some kind of statement in your "User Group Update" column.

Jean Nance, President
Meeting 64/128 Users Through the Mail
St. Joseph, IL

Thanks, Jean. We'll include such a statement in "User Group Update" beginning with this issue. COMPUTE! strongly opposes software piracy in any form.

Don't Hammer That 64

I'd like to tell Bill Fullman ("Hammering the 64 to Death," April) that if he cannot get any satisfaction from a 64 that he won't get any from any other computer. If Bill buys another machine, like an Apple IIGS, he'll probably send the same kind of letter he sent you to an Apple magazine.

Andy Orthmann
La Center, WA

In response to Bill Fullman's letter, I'd like to say think twice before hammering your 64. You have a computer that's almost a legend in the computer business. It's survived since 1982.

Diego Zamboni
Baja California Sur, Mexico

I suggest that Bill Fullman read his owner's manual. He'll find that there's a switch in back of the 1525 printer marked T,4,5. The *T* is for test patterns, and if the switch is set there, that's all he'll get. He should set his switch to 4. Also, if he wants to smash his 64 and printer, fine—but it would make more sense to sell it and use the money to buy a new computer.

Dan Hunter
Rohnert Park, CA

Advice on Printers

Thanks for the info on printers ("The Care and Feeding of Dot-Matrix Printers," May). The article recommends the use of WD-40 on printhead guides. I've found that WD-40 causes a gummy-substance buildup. I'd recommend a silicone product. Also: A pox on printer-ribbon manufacturers who do not identify the ribbon by number on the plastic case. After you've thrown the box away, you no longer have an identification number.

William Bernheim
Oroville, CA

Although "The Care and Feeding of Dot-Matrix Printers" article is informative, some points are not necessarily true for all printer models. For instance, the statement "Apply a little light oil occasionally to the printhead guides . . ." is not entirely true. Some printer manufacturers do not recommend using any kind of lubrication on their printers. On most printers, the printhead is mounted to a carriage assembly which rides on a carriage stay. Usually the carriage assembly contains *oilite* bearings that do not require any lubricant. In fact, lubricating the carriage stay could damage the bearings. If the bearings do require lubrication, then a commercial lubricant such as Tri-Flo is recommended. Unlike WD-40 or sewing machine oil, this lubricant is teflon based and does not have a tendency to attract dirt or dust particles.

Cleaning the platen with alcohol is not a good idea because not all platens are manufactured from the same substances—alcohol could damage the platen. Platen cleaner is recommended and can be purchased from most office-supply and/or computer stores.

In addition to the label information given, the labels should be of good quality, preferably adhesive labels with rounded corners. Labels of this quality have less of a tendency to catch on any printer parts.

Robert L. Loar
Mission Viejo, CA

Robert Loar is a printer technician. We always appreciate and welcome this kind of feedback from readers.

Programming Pros and Cons

I'm starting to learn programming on the 64 and would like some advice. What are the pros and cons of programming a 64? If this is not a good computer to learn programming on, what is?

Chris Olvera
APO, NY

You'd no doubt get a variety of opinions if you asked a variety of programmers. One opinion is that the 64 is an excellent machine for programmers because its design includes a built-in BASIC and a good screen editor—and it permits various levels of control over graphics and sound. Another point in its favor: There are many excellent books and programming tools available for the 64. Gazette *teaches programming on a regular basis in "BASIC for Beginners" and "Machine Language Programming." Millions of people have learned to program—and program well—on the 64.*

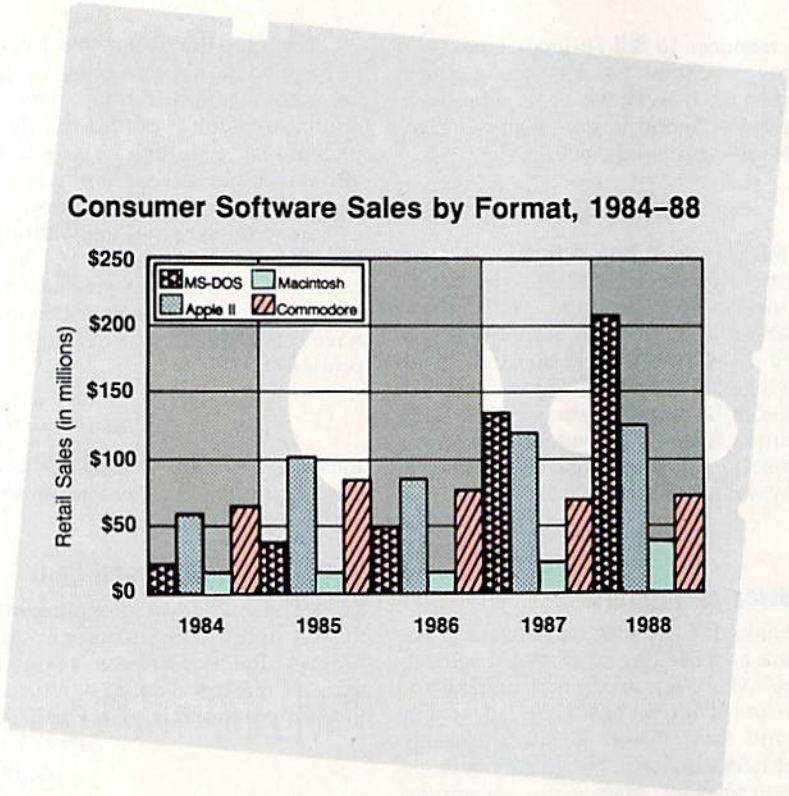
Another opinion is that the 64 forces you to work with a limited—but arguably adequate—BASIC language, a slow disk drive, memory constraints, and a relatively slow microprocessor. The hardware limitations make it difficult to program in any structured language, such as Pascal, C, or even BASIC.

If you're going to learn to program in machine language, the 64 is a great choice because of the control afforded by its custom sound and graphics chips. If you want to stick with BASIC, consider a 128; its BASIC 7.0 is excellent—far superior to the BASIC 2.0 of the 64. **G**

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Edited by Mickey McLean



Software Sales Up

Consumer Software sales were up 26 percent in 1988 as compared to 1987 according to the Software Publishers Association, a principal trade group made up of over 440 members who represent publishers in the consumer, education, business, and vertical markets of the software industry.

The compiled data, which was provided to an accounting firm from approximately 40 consumer software firms, accounted for over $465 million in 1988 domestic retail sales. The term *consumer software* refers to personal computer programs used primarily by individuals in a home environment and includes computer games, personal graphics and financial programs, and home educational titles.

The SPA reports that recreation software sales, which comprised 57 percent of overall consumer software sales in 1988, has been dominated by the MS-DOS format in the past two years, taking the place of the former number 1 selling format, the Commodore 64/128. The SPA attributes this newfound dominance to the increasing popularity of the IBM PC and compatibles in the home and the growing availability of high-quality MS-DOS recreation software with enhanced graphics and sound capabilities.

According to the SPA, approximately 44 percent of total consumer software sales is attributed to MS-DOS software, 26 percent to Apple II, 16 percent to Commodore 64 and 128, 7 percent to Macintosh, and 6 percent to other computer formats, including the Amiga and Atari ST.

The SPA first began to monitor domestic retail software sales in 1984 and has since determined that the industry has grown approximately 177 percent with an average yearly growth of 31 percent. During this same period, the SPA has estimated that MS-DOS consumer software sales have increased 1214 percent—from approximately $15 million in 1984 to $203 million in 1988.

Word Processing for 128—CP/M

The Public Domain Software Copying Company (33 Gold Street, Suite L-3, New York, New York 10038) now offers *WordStar* version 2.26 ($39.95) for Commodore 128 CP/M users.

This version includes MailMerge, which allows users to merge text and/or data files to generate form letters, boilerplate text, mailing lists, and large documents. The version comes complete with an Osborne 1 User's Reference Guide, which explains how to use *WordStar* and includes sections on the CP/M operating system. The guide also describes how to use other programs available from PDSC, including *SuperCalc* and Microsoft BASIC. The package also contains a set of Key Fronts, self-adhesive letters that attach to your keyboard and include all the commands needed to use the special word processing functions of *WordStar*.

Freebies

Buy two Cinemaware games and receive a third game free. Purchase choices include Cinemaware titles such as *Rocket Ranger* and *The Three Stooges*, Spotlight titles including *Total Eclipse* and *Speedball*, and any other titles that were released through June 1989.

In order to receive the free software, you must send in the original dated sales receipts from your two purchases, the completed registration cards, a coupon found in specially marked packages and available from many software retailers, and $3 for shipping and handling. You can choose either *Defender of the Crown* or *Sinbad and the Throne of the Falcon* as your free game.

The "Buy Two, Get One Free!" offer is available only through Cinemaware (4165 Thousand Oaks Boulevard, Westlake Village, California 91362) and is good while supplies last.

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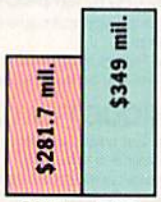
COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Commodore Revenue Increases



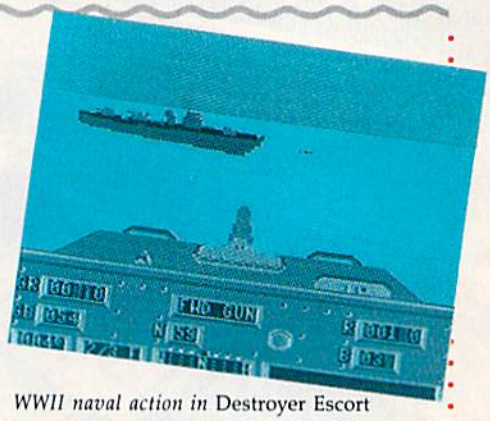
Commodore International (1200 Wilson Drive, West Chester, Pennsylvania 19380) reported that sales for the second fiscal quarter, ending December 31, 1988, increased 24 percent—to $349 million, compared with $281.7 million during the same period last year.

European operations accounted for more than 70 percent of total sales for the December quarter according to Irving Gould, chairman and chief executive officer of Commodore.

Convoy Escort Service

As mentioned in last month's column, *Destroyer Escort* ($39.95), a naval combat game, has now been released by Medalist International (MicroProse Software, 180 Lakefront Drive, Hunt Valley, Maryland 21030) as part of its new MicroPlay Software line. You assume the role of commander of a destroyer escort ship in the North Atlantic during World War II.

You're responsible for the safety of a World War II supply convoy in this one-player game. Choose from six convoy routes, each with three difficulty levels and different challenges including routes prone to submarine attacks.



WWII naval action in Destroyer Escort

The escort ship's weapons include torpedoes, a five-inch gun, depth charges, and an antiaircraft gun set to do battle with submarines, aircraft, and surface ships. You control the ship and its weapons by selecting from seven different battle screens.

The Free-Spirited 128

The latest Commodore 128 release from Free Spirit Software (P.O. Box 128, 58 Noble Street, Kutztown, Pennsylvania 19530), *Poster Maker 128* ($29.95), allows you to create posters as large as 5 × 5 feet.

Print out posters or save them to disk as picture files. A graphics utility permits you to import *Basic 8*, *Sketchpad 128*, or *Spectrum 128* graphics files which can be enlarged on both the *x*- and *y*-axes. Also included is a clip-art creation utility that reduces the size of graphics screens.

Poster Maker 128 operates on the Commodore 128D or the Commodore 128 with a 64K video RAM upgrade in 128 mode with an 80-column display. Resolution is 640 × 200 pixels. A 1351 or compatible mouse and a 1571 disk drive are required. Optional support is provided for a 1571 or 1581 disk drive as a second drive.

Free Spirit has also announced an agreement with Walrus Software which allows it to publish *Basic 8* ($39.95), a graphics programming system for the 128 and 128D in 128 mode with an 80-column display. *Basic 8* adds over 50 new graphics commands to standard 128 BASIC. The programming environment allows 640 × 200 resolution in monochrome and 640 × 192 resolution in 16 colors without any additional hardware.

Other features include the ability to draw in a 3-D environment and commands for windows, fonts, patterns, and brushes. The package from Free Spirit includes a two-disk set containing the *Basic 8* language, RunTime library, demonstration programs such as *Basic Paint*, *Basic Calc*, *Basic Write*, utilities, and a new 200-page manual.

In conjunction with the *Basic 8* announcement, Free Spirit has introduced *Basic 8 Toolkit* ($19.95), a utility program for use with the graphics system. The toolkit features a point-and-click operating system that allows the creation of custom pointers, fonts, patterns, and icons. The utility also converts *Print Shop* graphics into *Basic 8* graphics files. Colors can be added to the patterns, icons, and *Print Shop* graphics with the color option. The toolkit also contains a set of disk utilities. Files created with *Basic 8 Toolkit* can be used in custom programs, in *Basic 8* programs, or with graphics programs such as Free Spirit's *Sketchpad 128*, *Spectrum 128*, or *News Maker 128*.

The Free-Spirited 64, Too!

Free Spirit Software (P.O. Box 128, 58 Noble Street, Kutztown, Pennsylvania 19530) has not forgotten the 64 user while pursuing the 128 market. The company has released an updated *ESP Tester* ($24.95) that includes both the 64 version and the 80-column 128 version.

ESP Tester uses the methods developed by Dr. J. B. Rhine and the Foundation for Research on the Nature of Man to test powers of ESP. The program tests for clairvoyance, precognition, and telepathy. Results can be displayed onscreen, or they can be sent to your printer.

A new 64 arcade game has also been released by Free Spirit. Players of *M.A.C.H.* become the ultimate warrior of the future, a M.A.C.H. (Maneuverable Armed Computer Human) who is equipped with deadly hand rockets. As enemy invaders attack the city, the mother ship releases the M.A.C.H. to do battle with enemy agents that become more difficult to destroy as the game progresses. Players must send the M.A.C.H. back to the mother ship periodically to rearm, replace armor, and recharge fuel cells. *M.A.C.H.* retails for $29.95.

COMMODORE CLIPS

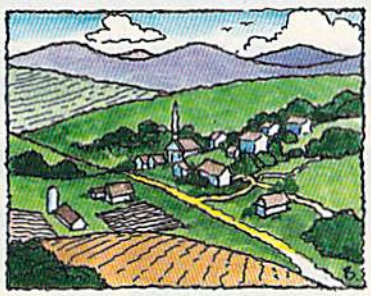
NEWS, NOTES, AND NEW PRODUCTS

Bank Street Data

Sunburst Communications (39 Washington Avenue, Pleasantville, New York 10570) recently released three new databases for *Bank Street School Filer* and a manual, *Bank Street School Filer Workshop Manual;* the company has also announced plans for a new database-disk-exchange program for students.

The *Our Town Databases* ($59) contain starter databases that focus on the theme of community. Students can research and explore their town's history, buildings, plant and animal life, and important people, places, and events; then they can fill in database records with their findings.

Designed for students in grades 4–12, the database allows students to analyze such issues as the impact of the environment on plants and animals in their town and the steps food must take in order to travel from its point of origin to the local grocery store. A complete six-unit curriculum is included in the Teacher's Guide.



Also included in the Teacher's Guide are instructions for participation in the disk-exchange program. After students finish entering data about their own town, they can take part in the Our Town Database Exchange, which allows students to compare and contrast their own communities with other towns and cities in the U.S. and Canada.

Two other new databases, *Climate and Weather Databases* ($59) and *Colonial Times Databases* ($59), have also been released by Sunburst.

Climate and Weather works with *Bank Street School Filer* to provide students in grades 4–12 with information on 72 weather stations around the world, 62 weather stations in the United States, and a starter database for students to record and analyze their own information about local weather. An activity in the accompanying Teacher's Guide has students assuming the role of employees of Climate Finders, a travel and relocation agency. Students must make travel arrangements for clients based on their weather-condition requests.

Colonial Times works with *Bank Street Beginner's Filer* or *Bank Street School Filer.* Seven different databases contain information on historical and other aspects of the 13 colonies, including prominent Native American tribes; significant political events; the lives of various patriots; descriptions of the jobs performed; information on games, recipes, remedies, and crafts; and profiles of four fictional and one actual colonial family. Teacher's Guide activities are designed to give students in grades 2–6 examples of colonial life.

Sunburst has also released *Bank Street School Filer Workshop Manual* ($69). The manual includes a complete set of training materials to help teachers in the classroom.

Leisure Genius Breaks from EA

Electronic Arts has announced that its distribution agreement with England-based Leisure Genius/Virgin Games has ended, and that Virgin Games will begin distributing its products through its American subsidiary, Virgin Mastertronic. EA will continue to distribute Arcadia games for Virgin Mastertronic.

Commodore Loses European Head

Harald M. Speyer, head of European operations for Commodore International, resigned on January 31 according to *Business Week.* The 48-year-old West German helped Commodore avoid potential financial ruin in 1985 and 1986 by selling IBM PC–compatible computers to West German businesses while the U.S. home computer market was growing soft.

Speyer had expanded sales throughout Europe, which accounted for 70 percent of Commodore sales during the latter portion of 1988. German sales presently account for 30 percent of Commodore's worldwide business. Sales of the Amiga line have also boosted Commodore's share of the European market from 2.7 percent in 1987 to 3.5 percent in 1988. Commodore International President Mehdi R. Ali has not replaced Speyer, who, according to *Business Week,* is looking for a company to buy.

Don't Get Burned

Miles Computing has released *The Magic Candle* ($39.95), a medieval fantasy role-playing game designed and published by Mindcraft and distributed by Electronic Arts (1820 Gateway Drive, San Mateo, California 94404).

You must save the land of Deruvia from the wrath of the archdemon Dreax, who has been imprisoned within the flame of the magic candle. Stop the candle from melting before Dreax escapes and wreaks havoc on the peaceful land of Deruvia. During your adventure in Deruvia, you'll encounter elves, dwarves, goblins, wizards, and any of 26 types of monsters. To defend yourself, you can utilize sword swinging, fireball throwing, or the casting of one of 24 magical spells. With a team of 25 characters, you can explore 54 levels of dungeons, six towns, six villages, and two castles. G

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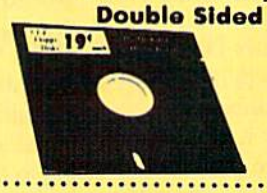

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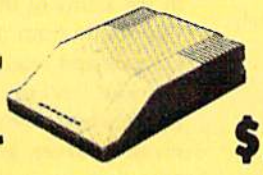

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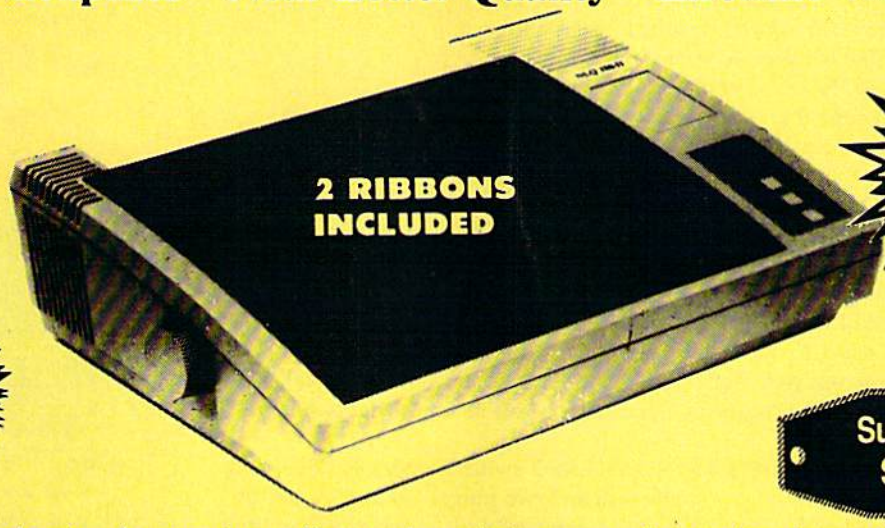

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Speakers, Stereo, and MIDI Solutions

Art Hunkins

For the price, you can't beat the 64 (or 128), with its proprietary Sound Interface Device (SID) chip. But the musical capability of these machines is not limited to a single, built-in source. Here are three methods, ranging from simple to complex, for extending and improving your computer's sound and music capabilities. We'll look at connecting to a hi-fi system, adding stereo SID, and using your 64/128 to control a MIDI system.

Sure, the SID chip is great, but there's still lots of room for improvement. Here are three different methods for dramatically expanding the sound quality of your 64 or 128.

Interfacing SID to Your Hi-Fi

The simplest way to improve sound quality is to bypass your monitor's tiny speaker and its tinny sound and hook your computer into your home hi-fi system. If you're using a monitor instead of a TV, you already have one of the required cables: an eight-pin-DIN-to-multiple-RCA-plug cord. This is the cable that connects to your monitor. If your hi-fi amplifier has a MONO/STEREO switch, you need only add an extension cord that has an RCA plug on one end and an RCA jack on the other. Lengths range from 3 to 12 feet.

Unplug the audio lead from your monitor and attach the extension cord. With the amplifier off, connect the RCA plug to an available amplifier input, either left or right channel. This can be AUX, TAPE, TUNER, or even CD In—anything except magnetic PHONO.

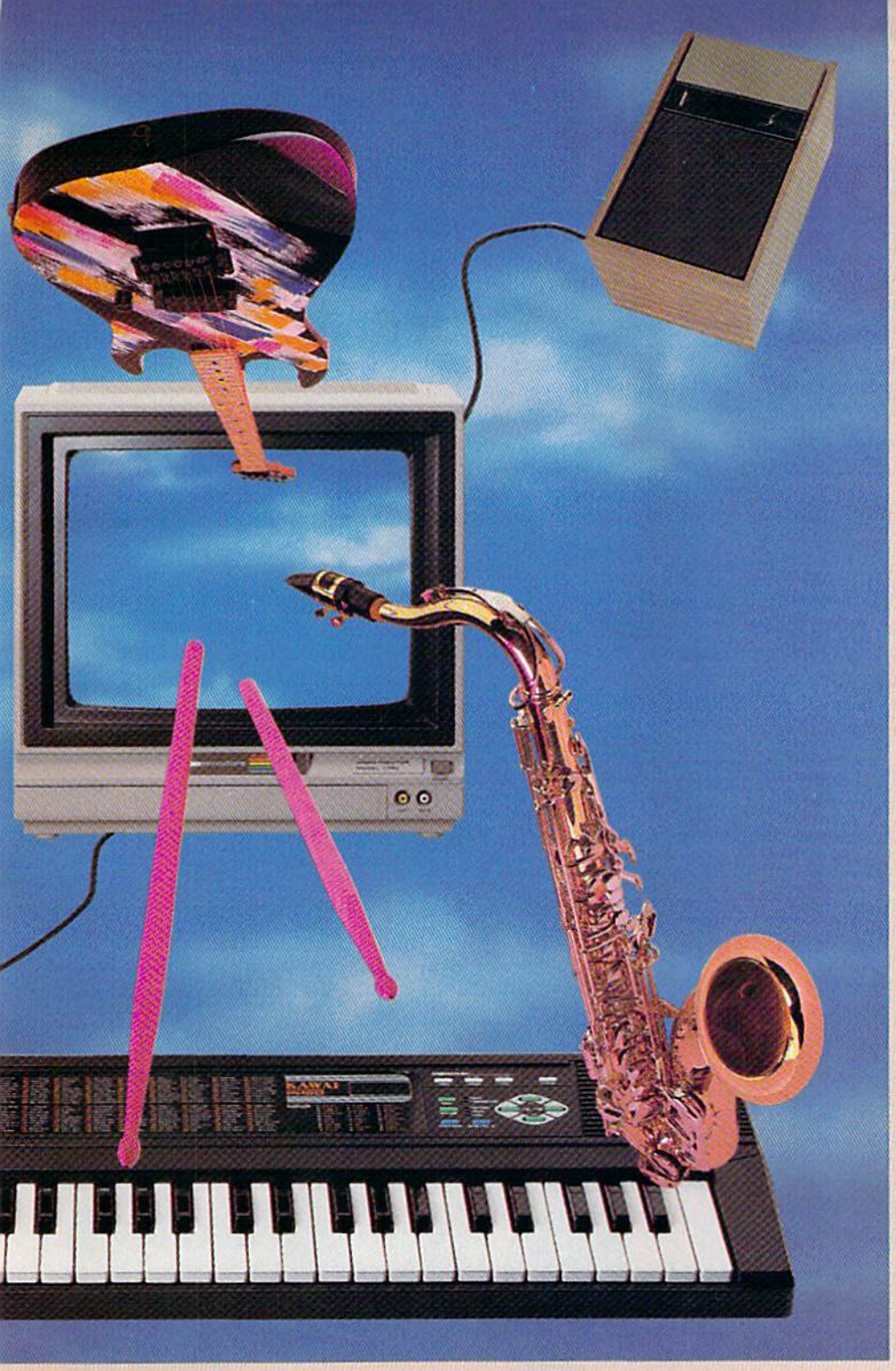
Set the MONO/STEREO switch to MONO and the selector switch to whatever input you've patched into. (If you've selected TAPE, switch the tape monitor control to TAPE.) Turn your amp on, and your computer should sound from both speakers of your hi-fi system. Use your hi-fi's tone or equalizer controls to shape the sound quality to your liking.

If your amplifier doesn't have a MONO/STEREO switch, you'll need one more cable: an RCA-plug Y-connector with a single jack and two plugs. Again with the amplifier off, attach one end of the extension cord to your monitor cable as before; then plug the other end into the jack on the Y-connector. The other two ends of the Y cable connect to the left and right amplifier inputs of your stereo.

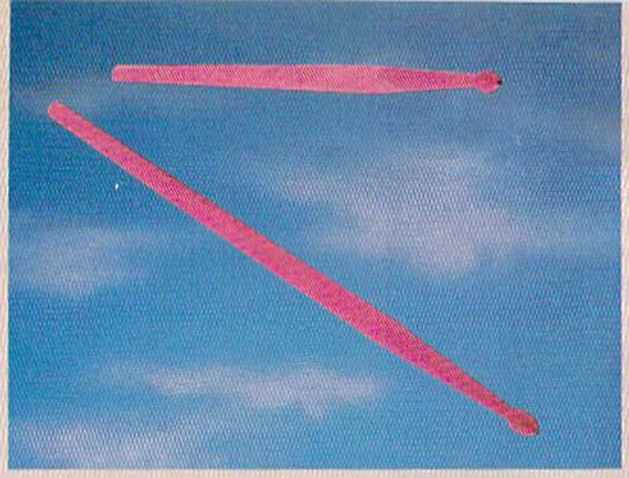
If you're using a TV instead of a monitor, you'll also have to purchase an eight-pin-DIN-to-multiple-RCA-plug cable. Continue to use your TV for video—just turn down the sound. Attach the DIN plug to the rear of the computer. It will only go into one socket. Now locate the audio lead. With the volume down, plug each lead into the amplifier while you're running a program that produces sound. When you hear the sound on your amplifier, you've located the proper lead. The video lead will give a lot of high-frequency white noise.

The Commodore 1902A monitor presents a problem: The audio output is not available on a separate connector. Both ends of the cable are DIN plugs. To use it, a special cord with a separate pin plug for audio would have to be made—a project not suited for the average user. ▷

Make it



Sing!



With the exception of the eight-pin DIN cable, which can be found at most Commodore outlets, all cables are sold at Radio Shack.

SID Programs

Even the best sound chip and hi-fi system are of little value without flexible composing/arranging programs, arrangements to play, and driver programs to perform them. Fortunately, all of these are readily available. Prime sources for music editors (composing/arranging programs), players (play programs), and music files are user groups, bulletin boards, information services, and publications.

Probably the best SID editor is *Sidplayer,* by Craig Chamberlain. *Sidplayer,* originally published in COMPUTE! Books' *All About the Commodore 64, Volume Two,* was entirely rewritten for both the 128 and the 64 and appeared in *COMPUTE!'s Music System for the Commodore 128 and 64: The Enhanced Sidplayer* (COMPUTE! Books, Chilton Book Company, Chilton Way, Radnor, Pennsylvania 19089; 800-345-1214). *Sidplayer,* the fullest implementation of SID-chip capability I've ever seen, is a composition program that should be in the hands of every composer/arranger for SID.

This enhanced version is available only with a disk ($24.95) and contains numerous utilities and an extended collection of musical examples. Original *Sidplayer* files are compatible with *Enhanced Sidplayer.*

Hundreds of arrangements for *Sidplayer* are available on major telecommunications networks, including QuantumLink, CompuServe, Delphi, and GEnie. These pieces can also be played via stereo SID, which is discussed later.

With enhanced and stereo versions, SID becomes a significant medium for the composer/arranger. For mono, stereo, and MIDI applications, perhaps the most helpful SID information service is QuantumLink. The QuantumLink subgroup for musicians is the Music Room.

Q-Link is where Mark Dickenson's outstanding software for stereo SID is available, as well as Chamberlain's recent work in converting SID files to MIDI playback. (See the discussion of MIDI which follows.) Perhaps the simple realization that SID files can now be played through MIDI is a further reason to be excited about composing for SID.

East Meets West

Hindu Music from Texas—64 Style

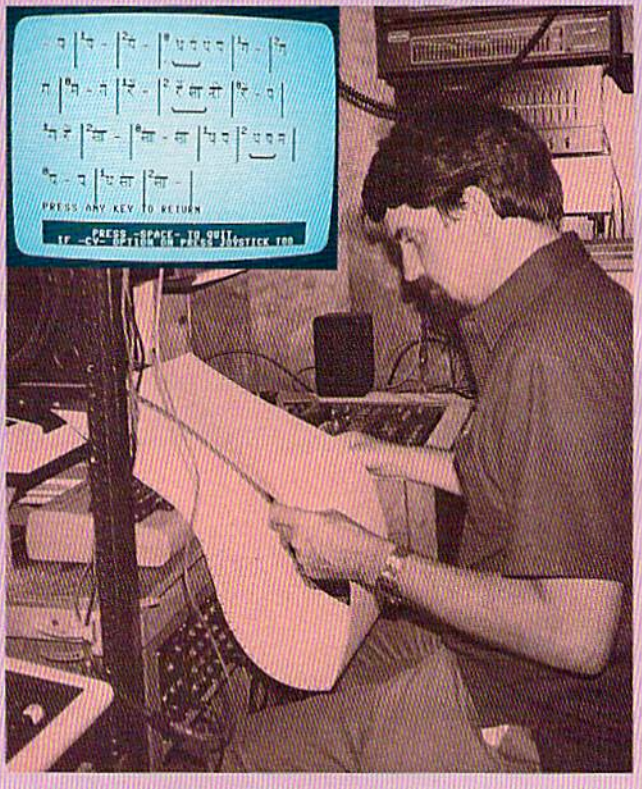
Few American musicians become proficient in the classical music of India, but there's a Commodore owner in Houston who's an exception. This Texan plays and composes Indian music, has written a book about it, and teaches it—with a little help from his 64.

David Courtney, who is working on a doctorate in ethno-musicology, has spent most of his adult life studying Indian music. For the past three years, as part of his doctoral dissertation, he's been working on a unique musical program for his 64 that will help him teach the music to others.

In developing the software, Courtney overcame several difficulties not encountered by Western programmers and musicians. Notation is a particular problem. It's difficult to write Indian music in Western staff notation because of inherent differences in the way the two systems express mode, tempo, and key. It's possible, but it forces musicians to compromise in many areas.

To avoid these compromises, Courtney incorporated India's *Bhatkhande* (Sanskrit) music notation into his program. As a composition plays on the 64, the corresponding Bhatkhande musical symbols scroll across the screen. "This visual and audio feedback is very useful for a beginning student to acquire a sense of the notation and structure of the music," Courtney says.

Students using Courtney's program can accompany selections recorded on the disk, or they can input, edit, and save their own compositions. There's even an option for obtaining Sanskrit printouts of the music from a dot-matrix printer. Similar features are found on conventional music programs, but Courtney's system deals with Indian music purely in Indian terms.



David Courtney composes Indian music with a unique program he's written on his 64. *Inset:* Courtney's personally designed Bhatkhande musical notation.

Expanding to Stereo SID

One of the most exciting developments in SID sound is stereo. A plug-in cartridge furnishes three new voices for the right channel, while voices from the built-in chip are routed to the left. Though several units are on the market, the best is the SID Symphony Stereo Cartridge ($34.95), by Dr. Evil Laboratories (P.O. Box 190, St. Paul, Indiana 47272).

Essential to those lacking access to online-service software is a $1 public domain disk also offered by Dr. Evil. It contains the latest version (version 10) of Mark Dickenson's Stereo SID Player, plus a sizable six-voice song collection.

Dickenson's software (available on Q-Link) is a remarkable piece of work, and version 10 is a significant improvement over earlier editions. It is the first to support Chamberlain's *Enhanced Sidplayer* additions. It also offers significant new options for performing mono SID songs in realistic pseudostereo. The principle behind stereo SID is simple: Compose two Chamberlain *Sidplayer* files, one for the left channel and one for the right. Stereo SID Player performs them simultaneously.

As when you're using mono, you need Chamberlain's *Enhanced Sidplayer* if you want to create your own arrangements. To simply play files and experiment with stereo performance options, Dickenson's Stereo SID Player is all you need. In a nutshell, Stereo SID Player offers everything in stereo that *Sidplayer* does in mono—and more, including transpositions, programmed replays, and a jukebox mode. Even without stereo SID files, the performance options alone justify getting into Stereo SID Player.

Stereo not only gives you three more voices, but it also permits richer sounds through voice doublings and transpositions. It allows spatial manipulation and projection of sounds and, in general, the fuller sonic experience we have come to expect of stereo. If you haven't experienced stereo SID, you're in for a real treat.

Connecting the battery-powered SID Symphony Cartridge is simple. First, with the volume down or off, connect your normal audio lead (as described previously) to the left channel input on your amplifier. A Y-connector is unnecessary; instead, obtain an RCA-plug cable the same length as the left-channel extension cord. Select STEREO mode if you

Courtney's program offers students bilingual menus in English and Hindi. While printing English text presented no problem, Courtney was forced to create special characters using a technique he calls *pseudobitmapping* to produce the Hindi script on the 64.

Bitmapped graphics would provide the resolution required for reproducing Hindi text, but they would also require a large chunk of memory. Pseudobitmapping basically is the same as redefining characters, Courtney explains, but it takes a new part of your character RAM and defines another pseudobit buffer. The redefined Hindi bit patterns are kept elsewhere in memory until needed. Then, just before use, they are transferred into this buffer, where they can then be called from either BASIC or assembly language. That way, you get the convenience of programming English text in text mode while getting the resolution and power of bitmapping through the pseudobitmap buffer.

Now that the program is in beta testing, Courtney is negotiating with several institutions in India. By next year he expects to have the first computer-assisted music-education program in that country. Courtney hopes his program will find wide acceptance with musicians, teachers, and others interested in the traditional music of India.

Courtney himself was introduced to Hindu music as a teenager through the recordings of Ravi Shankar, the internationally renowned master of the sitar. In the 1970s, after working toward an engineering degree for two years at Texas A & M, Courtney decided against a technical career, pursuing his interest in Indian music instead.

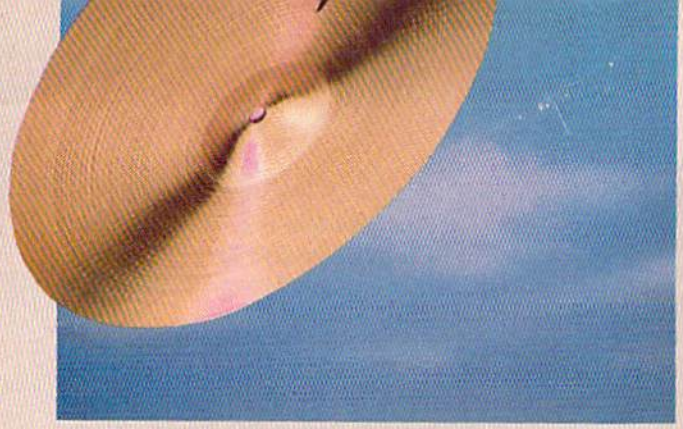
After two years of study in California, Courtney moved to India in 1976. For the next four years, he apprenticed with a percussion music teacher, studying the *tabla*, a pair of drums covered with goat skin and buffalo hide. Courtney became so proficient on the instrument that he wrote a book on the subject that was published in India.

Before returning to the U.S., Courtney married an Indian who is herself an accomplished singer. They both now teach at a school of Indian dance and music in Houston. Most of their students come from the community of about 20,000 Indians living in the Houston area.

A few years ago, Courtney decided to use his early interest in electronics and computers to help him teach students to play the *tabla*. Students practicing these drums usually accompany a repetitive musical phrase called a *lehra*. The computer is an ideal instrument for playing this melody since it repeats the phrase at a constant speed and as often as the student wishes. As a student's skill increases, the lehra's speed is easily increased.

The *Raga*, an ancient traditional Hindu melody, is as rich and varied as any music found in Western cultures, and it offers a wide range of musical texture, ornamentation, and elaboration. But India is changing. In many ways, the country is becoming Westernized, and Courtney says Indians are abandoning their traditional music, art, and culture. Courtney hopes computers can help preserve and revive this ancient musical art form by making it easier for students to learn.

Courtney's program, which employs easy-to-use menus, is designed for musicians who may have little or no experience with computers. "I'm trying to make things as simple as possible," he says, "because I want a program that can be operated in India by musicians and not computer techies. In a sense, the program is structured like a word processor, but instead of working with words and numbers, you're working with ragas."



have a MONO/STEREO switch. Attach your cable to the SID Symphony cartridge and the right channel input of your amp.

The MIDI Connection

MIDI (Musical Instrument Digital Interface) is the way in which computers and musical instruments exchange information. With a 64 or a 128 controlling one or more MIDI-compatible instruments, you get high-quality audio, exciting and dynamic sounds, and a variety of live-performance and storage options. With an appropriate sequencer program, your computer practically becomes a multitrack, editable, digital tape recorder.

It is beyond the scope of this article to fully explain MIDI and what it can do on your 64 or 128. Fortunately, information is available from many sources; a particularly good article appeared in the August 1988 issue of *Gazette*. The 64 and 128 function well at the heart of any but the most sophisticated collection of MIDI instruments, and they do so at a considerably lower cost than other systems. This is not to say that MIDI comes cheap; it doesn't. Even an entry-level system costs a minimum of $120 (compared to $35 for stereo SID).

The SFX Sound Expander and Software

The low-cost way to get into the wonderful sounds and multiple voices of FM synthesis and MIDI is with a cartridge designed specifically for the 64 and 128—the SFX Sound Expander. The Sound Expander is produced by Commodore Great Britain and is distributed in the U.S. by Fearn & Music (519 West Taylor #114, Santa Maria, California 93454; 800-447-3434). The SFX Expander (FM Sound Module) itself sells for $90, while the mandatory (and highly protected) FM Composer/Sound Editor software goes for $30.

An external, full-sized, five-octave keyboard is available for $80, but with the limited note-entry capability of the Composer/Editor, I am not convinced it is worth the investment. The keyboard is simply a control device. It does not produce sound and is not involved in playback, but it is an inexpensive way to program, store, and play your own FM sounds.

One of the real limitations of the Expander system is that its external keyboard cannot be "recorded" by the computer in realtime, though it can be played. When you're composing or arranging, the keyboard furnishes pitch data, one event at a time. This is a feature of the Composer software, which operates only in step-time. This is not a full-featured sequencer program. A small keyboard overlay, offered at $10, may be more convenient than ASCII keyboard note entry, even when assisted by the included stick-on note tabs.

The SFX Sound Expander uses the same kind of chip found in Yamaha synthesizers—a simple FM system with two operators (Operator Type LII, or OPLII). Forty-eight sounds are available at once, and most of them are of high quality. Unfortunately, the software offers only one bank, along with three expander sets of 12 sounds; you have to create others yourself. Up to nine notes can be played at a time, or six pitches plus five preset percussion voices. Fixed rates (a hardware limitation) of tremolo and/or vibrato can also be added to either tone generator (operator).

The editor software allows you to program a keyboard *split point* so that pitches above the point have one tone quality, and those below it, another. The real joy of this system is its multitimbral playback capability. In the Composer, assign each of the nine voices a different color and change colors wherever you wish. Dynamics, articulation (whether notes are connected or not), and transposition are also independently controllable in each voice.

The Sound Editor is solid, if not elaborate; it serves as a fine hands-on introduction to FM sound synthesis. The seven-page, well-produced manual suggests that FM synthesis is difficult to understand (which is true), so the Editor offers a simple approach to producing sounds. You visually spin a Fruit Machine—the British term for a slot machine—to generate sounds with a variety of random parameters. You can then immediately play, study, edit, and save these "found sounds." This is a significant learning tool. The Editor also includes a basic eight-beat percussion sequencer, Rhythm Machine, capable of real- or step-time programming. It offers a choice of ten different preset drum kits.

The system has a number of significant limitations. The Composer/Editor software includes just one song. The disk accompanying the Expander hardware has only three. There is little integration of Composer and Sound Editor programs; you must completely leave one before entering the other. The two programs can't even play each other's songs. In particular, the basic Expander program cannot perform arrangements you make with Composer; this is unfortunate.

The external MIDI implementation is also spotty. There is no way to feed in external MIDI song files (or sound libraries) from other systems.

You need an additional MIDI interface just to connect any other instrument to the system, either for note entry or playback. Though the Expander contains an interface slot (so that the Expander and an external MIDI keyboard can play back together, creating rich textural overlays), the only compatible interface is the SFX Interface ($64), from Datel. (Software designed for the Datel interface is rare.)

You can use an external MIDI keyboard or drum machine with an SFX Interface for step-time note entry and stand-alone performance if you wish. By this time, however, you've pretty much invested in a full MIDI system, and it might be better to forget about the Expander and go with more flexible software.

Nevertheless, for just $120 you can purchase an SFX Sound Expander and FM Composer/Sound Editor software to write your own arrangements in step-time, hear them in up to nine-voice, multitimbral playback, and generally experiment with the fascinating world of FM sound.

You'll have to live within strict limitations imposed by the program, and you'll have to be fairly self-sufficient. Only one program, the FM Composer/Sound Editor, is

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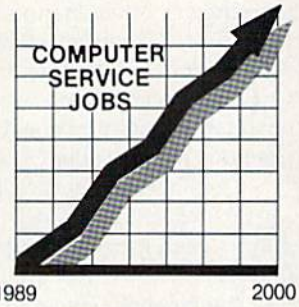

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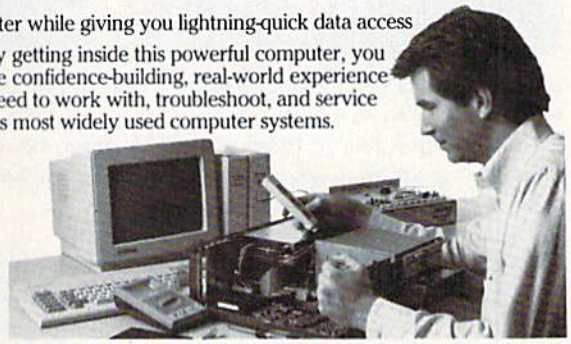

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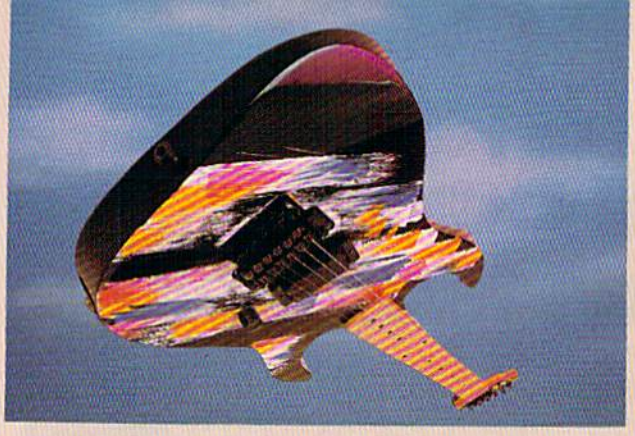


available for the SFX Expander. While SFX is by far the least expensive way to enter the world of FM sound, it is neither expandable nor able to import materials from other systems. Future software development for SFX is unlikely.

Other MIDI Hardware

Moving up to a full-fledged MIDI system can be expensive. You will need a MIDI-compatible keyboard ($130 and up), a MIDI interface for the 64/128 ($50–$100), one or two MIDI cables (five-pin DIN cables sold by music dealers for $6–$8 each), and software ($30 plus—unless you go with public domain). Two cables are required only if you intend to record and play back from your keyboard.

Most MIDI keyboards have mono output (only a few have stereo), and you will likely need a phone-plug-to-RCA-plug cable to connect your amplifier to the output jack on your keyboard. Unless you have a MONO/STEREO switch on your amp, you'll also require an RCA Y-connector (one jack to two plugs).

The Casio MT-240 is the least expensive MIDI keyboard currently available, retailing for $139.95. It has miniature keys (four octaves) and its tone colors cannot be programmed. It produces a particularly good piano sound, along with 119 other sounds; comes with built-in speakers; and can play ten notes simultaneously. It lacks a headphone jack, keyboard split, and polytimbral capability.

Casio's CT-640 ($337.73) has five octaves of full-sized keys as well as built-in song memory and a headphone jack. Possessing all the features of the MT-240, the CT-640 includes 465 preset sounds, but it also lacks sound programmability.

The entry-level Yamaha (FM) MIDI synthesizer is the PSS680 ($250). It incorporates stereo speakers, percussion pads, song memory, reverb, and a headphone jack. Though its keys are small, it has five octaves. Best of all, its two-operator sounds are at least partially programmable through a small LCD display.

The Casio PMP300 is the least expensive, full-sized multitimbral keyboard. Retailing for $269, it features four octaves and 210 sound mixtures.

Full-featured keyboards—such as the Yamaha DX11, with velocity and after-touch sensitivity, five octaves of full-sized keys, and a split keyboard (or multitimbral capability)—start at $840. Their features are what tend to make MIDI instruments expensive.

Various companies—Yamaha, Casio, Roland, Korg, Kawai, Oberheim, Ensoniq—have different methods of creating sound, and the results are often strikingly different. If you are concerned with variety and want to experiment with sound color, look for the most flexible and open system. Ask for a demonstration of as many varied sounds as possible. Wide-ranging programmability is your ticket to creative sound making.

MIDI Software

Craig Chamberlain's *Enhanced Sidplayer,* MIDI edition, is available in a special version for Casio CZ keyboards—a low-cost but now-discontinued series. (He is said to be working on other manufacturer-dependent editions as well.) The CZ version allows you to play any mono SID composition in multiple tone colors on CZ keyboards. Chamberlain's software, available on Q-Link, includes documentation outlining how to add commands to your compositions to access the CZ's special features.

Chamberlain's generic MIDI Player program opens up a great source (SID) of MIDI music for the beginner. It's the only software you need to get started—and it's free through Q-Link and some user groups. With Chamberlain's book/disk combination, you can create your own music and play it back either on SID or through your MIDI setup.

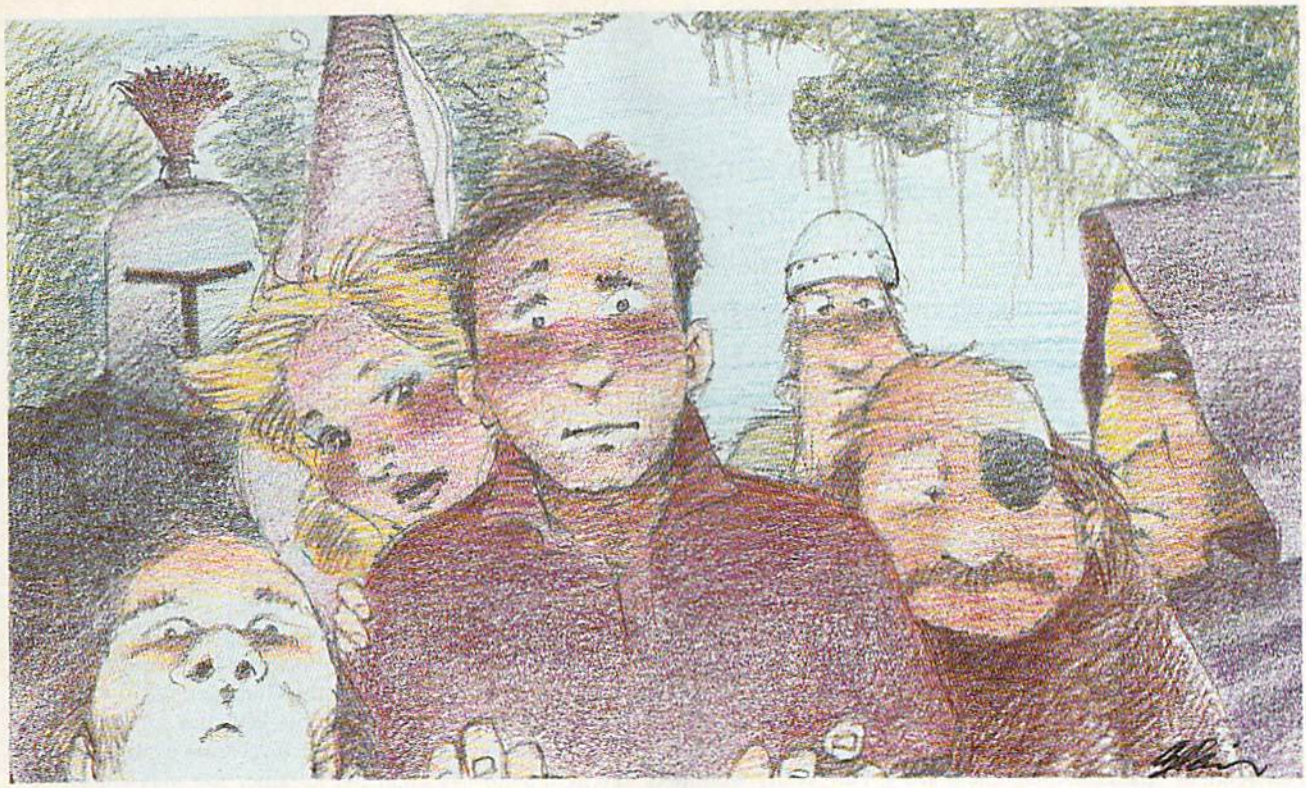
Two other commercial music programs offer an option of either SID or MIDI playback: *Instant Music* (Electronic Arts, $29.95) and *Advanced Music System* (Firebird/Activision, $59.95). Both packages let you play music through MIDI, using different interfaces, and with your choice of preset voice numbers. *Instant Music* comes already orchestrated for the Casio CZ101 and includes a large music library of rock-'n'-roll. It will even sync with a drum machine.

If you want to enter music into the computer via a MIDI keyboard in realtime, you need a bona fide sequencer program. At $70.00—$150.00, these multifeatured programs are customized for either the 64 or 128 and are designed to work with particular brands of interfaces. Before making a purchase, be sure to check the required interface. Offering significant sequencer and editor/librarian software are Dr. T, Sonus, and Passport. Also selling MIDI interfaces for the 64/128 are Datel and Sequential. Some interfaces are compatible with each other; others are not. Dr. T is compatible with Sequential; Sonus, with Passport. Datel isn't compatible with any others but is the least expensive ($49.95).

If your MIDI keyboard is programmable and you wish to create and save your own sounds, you'll need a librarian or a patch editor/librarian ($100 and up). Librarians are generic and work with a variety of synthesizers, but they don't allow you to edit or create sounds on the computer. Editor/librarians are keyboard- (or manufacturer-) specific and do allow you to create and rearrange sounds on a 64 or 128. Your best bet probably is to purchase an editor/librarian for the MIDI keyboard you own. If you want to construct your own sounds, make sure that the programmable synthesizer you buy has editor/librarian software available for it.

MIDI keyboards are widely available even in discount houses. Major music stores often have large MIDI departments with staff members who are knowledgeable and happy to show off their latest electronic instruments and processing devices.

There's a lot more music in your 64 or 128 than might casually meet your ear. Here's a chance to let your musical creativity loose and let your spirit soar. Good-bye, tinny speaker. Hello, hi-fi and stereo; good morning, FM and MIDI. Here's to many hours of good listening and happy arranging. **G**



Harry Blair

Online: *Island of Fantasy*

Cheryl Peterson

Dragons and ogres have long been a staple of fantasy games, but now several major online services have added some innovative twists. Here's an in-depth look at one world where the next character you meet in a dark dungeon may be another human.

I stand fresh off the dock on the Island of Kesmai. I look around, but no one seems to notice my presence. A quick check of my possessions (SHOW SACK, SHOW BELT) reveals one gold piece, some leather armor, a sword, and a shortbow. Not much, to be sure, but enough for a novice fighter like me.

I am about to enter the fascinating world of the Island of Kesmai, a multiplayer interactive game on CompuServe. Not only will I encounter dragons, trolls, and other creatures that inhabit fantasy games, but I'll also meet, talk to, and interact with as many as 100 other players who play this game simultaneously via modem and personal computer.

But first, I make my way through town, hoping to find the entrance to the dungeon where most of the action takes place. A vendor hawks a book purported to tell the way into the dungeon. Fortunately, before I arrived, I learned that the dungeon entrance is inside the temple that is north of my current location. I save my lonely gold piece for something more useful, though nothing in town comes very cheaply.

As I head for the temple (N N N—NORTH three times, or approximately 30 feet), I note the weapon and armor shops. With a little luck, I'll be able to afford better equipment once I fight some of the dungeon denizens.

I spot the temple doors and head for them. A town beggar accosts me, asking for a coin to buy a drink. "Sorry, friend," I say, "but I have no gold to spare."

I desperately wish I could afford to buy a few bottles of balm sold by the vendor here in the nave, but at 16 gold pieces each, they are far above my limited budget. Another player walks in from the square. "Hello, Cherp!" she says, looking at me. Taking a close look at her, I recognize Lynn, a middle-aged female fighter from my home country of Mnar. ▷

"Howdy to you. Are you headed down into the dungeon? I've just arrived and this is my first trip down," I tell her.

"Ah, I see. Yes, I was headed down, but I don't think it safe for you to hunt where I'll be going. Do you have any balm yet?" she asks as she stands next to the balm vendor.

"No, I haven't the gold to afford it," I say hesitantly.

"No problem; I have a few extra gold pieces. Come and get them."

"Thank you very much," I say. Lynn drops some gold on the ground, and we wait as the vendor takes the gold and drops the balm bottles for us. I pick up the bottles and add them to my meager possessions.

"I can't thank you enough for this," I say. "Is there some way I can repay you? Perhaps we could meet here again later and I could give you some balms in return."

"No," she laughs, "I have no need of them. Just remember there are always other players who are just starting out. They may find themselves in the same position you are in now. Try to lend them a hand when you are sufficiently strong.

"By the way—one other tip," Lynn says. "As soon as you can afford one, buy yourself a recall ring. There's a ring seller in the marketplace by the pawnshop. Choose a safe spot here in town and put on the recall ring. Then when you get into real trouble in the dungeon, remove the ring. You will be transported instantly back to the spot where you first put it on. The ring is useless once removed, so you will need to buy another if you use the first. But it's the best protection against sudden death if you take too much damage.

"Some of us carry a spare in our sack and put it on in the dungeon. This helps us get back quickly. Take care." So saying, she disappears in a flash accompanied by a thunderclap.

With my few balms safely stowed in my sack, I head down into the dungeon. No sooner do I alight on the bottom step than two ugly orcs approach from the south. Before I have time to think, they are on me (FIGHT ORC). I swing my sword and hope to end the fight quickly, but it is not to be.

My swing is wide and the orcs take jabs at me. Both score hits and I feel myself weakened by their blows. Again I swing, this time nicking one of them (AGAIN). Yet again I swing,

Kesmai is much more than a conventional computer game because it offers true multiplayer interaction.

and one orc falls beneath my blow (AGAIN). The remaining orc takes a swing at my head but misses. I dive beneath the blow and strike for its heart. Its armor blocks my blow, but I thrust again and it dies.

I laugh joyously. My first kill, but I am badly wounded. Taking a balm from my sack, I open and drink it (TAKE BALM FROM SACK AND OPEN IT. DRINK BALM AND DROP IT). Good health courses through my veins, and, instantly, all the damage inflicted by my opponents is healed. This balm is wondrous stuff.

Searching the corpses (SEARCH CORPSE. SEARCH 2 CORPSE), I find two gems and a few gold coins to reward me for my trouble (TAKE GEM AND PUT IT IN SACK. AGAIN. TAKE COINS AND PUT THEM IN SACK). One orc is wearing chain mail and I quickly remove my leather armor and replace it with its slightly dented armor (REMOVE LEATHER AND DROP IT. TAKE CHAIN AND WEAR IT). I continue my exploration.

Fantasy Games Meet the Online Community

This scenario may sound a bit farfetched, but similar stories take place each day on the Island of Kesmai. I spent several hours playing the game every day for two months. Some days, I spent 12 hours online. What I found was a wonderful alternate universe that's so engaging I almost didn't want to leave at the end of the day.

But Kesmai is much more than a conventional computer game because it offers an element that no home computer game can: Multiplayer interaction. Players standing in the same area of the game can talk to one another. It is also possible for several players to plan group attacks against tougher monsters. In fact, *soloing* a dragon or drake is not the recommended way to go about beating these critters. After all, monsters gather in packs to fight, so why not human players?

But I'm getting ahead of myself. How does one step into this world?

First, open an account with CompuServe. Before starting to play, you must create an alternate persona. The character may be male or female. You are given a choice of countries that your character may be from. A character generator will then show you statistics that it proposes for your character. These stats will determine some of your character's capabilities. If you're not happy with the ones displayed, tell the generator to reroll. It will keep doing so until you're satisfied with the character's stats.

When the statistics suit you, choose your profession and give your character a name. You may choose to be a fighter, a martial artist, a thaumaturge (magician), a wizard, or a thief. (Future plans for the game allow for a new class of characters called *sorcerors*.)

Each of these professions has benefits and drawbacks. I highly recommend getting a copy of the Island of Kesmai player's guide from CompuServe. It's invaluable and will save you considerable online time. A wealth of help files and information are offered in the MPGAMES forum on CompuServe. Libraries there contain maps, hints, and even a player-written guide called Uncle Balrog's Beginner's Manual.

The fighters and martial artists use brute force to win the day, while thaums and wizards tend to use magic to advance their causes. Thieves survive by hiding and stealing whenever possible, and by fighting if they get caught. When fighters advance far enough, they may make a pilgrimage to see Hermann the Hermit and become knighted. Knights have a minimum of magic power, but they can recognize thieves almost instantly. Knights can also "see through" a thief's hide spell if the thief is not more advanced than the knight.

Building Character

Once you've created a character, you have a lot of challenges ahead of you. Whatever your profession, you will almost certainly start your play with a trip to the dungeon, the first level of

which is designed to interest the beginning player. As you progress through the dungeon's levels, the monsters you meet become tougher. At the fourth level, the opponents are very difficult; few people of little experience visit those depths.

New players must acquire enough gold to promote their characters to higher levels. Usually this requires vanquishing numerous opponents. Thieves try to steal from those in the dungeon and then sell whatever they get. Another method is to run through the dungeon, picking up useful items like weapons and armor to take out and sell to the shops. Of course, to do that, it's wise to know which items have the highest resale value, since you can carry a limited amount of booty.

The beginning levels of the dungeon are enough to keep new players busy, but as your character gains experience you'll want to take on some of the game's more challenging aspects. Level 4 of the dungeon contains a dragon's lair. The dragon is a formidable opponent that does indeed breathe fire. The water channels in its lair provide some protection from the flames, but should you take a stunning blow while in the water, you'll drown unless you're wearing a water-breathing ring. These rings are found as treasure on some of the other critters in the dungeon.

If the dragon should manage to kill you, it almost certainly will eat you. (Hey, dragons have to eat, too.) If you're killed by the flames of its breath, the Ghods will resurrect you in the temple. If it gets you with tooth or a claw, you become Kesmian Dragon Chow and must reroll your character from scratch. Everything you own ends up on the floor of the dragon's lair. The only thing you have left is any money you may have in the Kesmai bank.

Run Away or Quit

Of course, if players are unable to cooperate, they are also able to fight each other. Kesmai frowns on battles between players, and it has a karma system that helps to deal with the problem. If you're a new player, though, you should be aware that there are people in the game who do nothing but prey on other players. There is not much to be done about these people. Kesmai has plans to take care of them on a permanent basis, but in the meantime, the best thing to do if attacked by another player is to either run away or quit the game momentarily.

Want to really get away from it all? Try spending your next vacation on the Island inside your computer.

Try to get the user number of the person who attacked you and report it to the folks who run the MPGAMES forum. If you do get killed, you might report it in the forum and see if anyone is willing to help you rebuild your character. Kesmai may even offer you some assistance. Killing other players is not the accepted mode of play.

A Step Beyond

Island of Kesmai is more than just a computer game. The interaction with other players and the cooperation in accomplishing goals make it a step above the ordinary. The challenges of Kesmai are very engrossing—even when you've developed a high-level character, there's still room to grow. New challenges are always being added by the Kesmai staff. Two new advanced game segments are being tested and a new basic game segment is also being written.

If you really want to get away from it all, try spending your next vacation on the Island in your computer. All it takes to play is a modem, a CompuServe account, and a little money. Be sure to open your account at least two weeks before your vacation is scheduled. Good hunting, and if you see CHICKENCHERP, DREAM.GEISHA, or SHADOW-.DANCER, say "Hi!" It might be someone you know. **G**

More Multiplayer Action

In addition to Island of Kesmai, you might want to check out some of these other multiplayer games found on the major online services.

CompuServe

British Legends. Attaining wizard or witch status in this game allows you to control what confronts other players. Points are won by finding and "swamping" valuable objects. Players can cooperate or fight each other. Stealing treasure is not unheard of.

MegaWars I—The Galactic Conflict (1–10 players). Use your spaceship to destroy enemy bases and ships, capture neutral and enemy planets, and build defenses.

MegaWars III—The New Empire (1–100 players). Two games in one: The first phase is similar to MegaWars I, but you can design your own ship; the second phase requires planetary management to build an empire. There is team play using the hyperspace radio. This is a four- to six-week game, with the winning team captain becoming Emperor of the Galaxy.

SeaWar (4 players). This game is similar to the board game Battleship and offers weekend tournaments.

SpaceWar (8 players). Faster-paced and more competitive than MegaWars, SpaceWar offers intership communication and weekend tournaments.

You Guessed It! The online community meets "Family Feud." Players compete one-on-one or as team members. This game offers real prizes.

GEnie

Gemstone. A fantasy role-playing adventure game on a smaller scale than Island of Kesmai, Gemstone is similar to British Legends. This game is still in its infancy.

Stellar Warrior. Blast enemy vessels and capture alien planets in this tactical space adventure. Stellar Warrior is similar to MegaWars and is operated by its creators.

Stellar Emperor. This game contains all the tactical features of Stellar Warrior but offers more strategic planning.

QuantumLink

Rabbit Jack's Casino. This online offering features casino games, five-card-stud poker, blackjack, slot machines, bingo, and five players per table in card games. The bingo payoff depends on the number of players; the slot-machine grand prize builds on the number of players and continues to build until someone wins it. It can go as high as 9999 Q-chips. This is the most inexpensive online game available.

REVIEWS

Spectrum 128

Simply put, the Commodore 128 has never lived up to its advance billing. When it first appeared, the machine seemed destined to replace the 64: It had more memory, higher resolution, faster disk access, 80-column standard—the works. In other words, the 128 was to the 64 what the Apple IIc was to the Apple II.

Trouble was, not enough people bought it. Another problem was the 128's complete compatibility with the 64. Now, this would seem to be a good thing, but in fact it worked, in part at least, against the 128's acceptance. Because the computer was 64-compatible, it ran 64 programs; because it ran 64 programs, nobody bothered to make 128-specific programs. Why port a program to a new machine, the prevailing wisdom went, when the new machine will run the existing program?

Then, because there weren't many 128-specific programs available, people didn't bother buying the machine—at least not in numbers comparable to the 64's. And so it goes.

There is, however, a healthy batch of 128s out there, and there are some companies that offer 128-specific software. Berkeley Softworks is a big supplier, of course, with its GEOS 128 line; Batteries Included and Timeworks have also supported the 128.

Now comes a line of 128-specific packages from Free Spirit Software, and whatever their merits, they're extremely nice to have.

Their merits, fortunately, are quite strong.

Spectrum 128 is a 128-specific paint program. In fact, it's not just 128-specific; its specificity runs deeper. To use *Spectrum 128*, you need a 128D or a 128 with the 64K video RAM upgrade (available from your dealer). In addition, you need a Commodore 1351 (or compatible) mouse and an RGB 80-column monitor.

Impressively from an artist's standpoint, Free Spirit has chosen quality of performance over guarantee of sales, but one wonders how much the decision has cost the company. Still, 128 aficionados will surely be happy that they are finally properly served.

Free Spirit has chosen quality of performance over guarantee of sales.

The program itself is good. It autoboots in 128 mode, then asks if you are using a 1750 REU and if your monitor is capable of Interlace Sync mode (the Commodore 1084 isn't, by the way). This latter option is impressive—again, because it recognizes the special needs of serious 128 users. Finally, the menu bar appears.

Spectrum's interface is straightforward. Clicking the right mouse button on Menu yields a pull-down list of several options. Options are also click-selectable.

Once you're in drawing mode, where you're actually working on the screen, the right mouse button controls what you draw. The left button brings up the color palette, and clicking on it a second time returns you to the menu bar. While you're drawing, the menu bar disappears.

The items in the menu bar are Paint, Shapes, Solids, Tools, and Extras. Each holds a host of options.

The Paint item, for example, offers Paint, Air Brush, Mirror, Multi-Color, Block Fill, Block Erase, Erasers, and Clear Screen.

Clicking on Shapes brings up Dots, Line, Lines, Rays, Box, Circle, Polygons, and Preferences. Polygons and Preferences both contain submenus as well: Polygons, for instance, allows Round, Dodecagon, Octagon, Hexagon, Diamond, and Triangle. You click on one of them and then create the shape you want on the screen.

Possible solids are Sphere, Donut, Cylinder, and Spool. When creating a solid, you can select its screen appearance with the Preferences options: View, Shade, and Light. View lets you draw the solid on either the horizontal or the vertical axis and lets you look at the donut shape from a top view. With Shade, you choose between Textured and Halftone—the former using a random dot pattern; the latter, a fuller-looking object. The Light option offers normal lighting or backlighting. With backlighting, the object shows light coming from behind.

From the Tools menu, you can cut and paste sections of your painting, fill in areas with one of many fill patterns available on Spectrum's data disk, put text into the painting (using, again, one of many supplied fonts), or edit colors or pixels.

Editing pixels is *Spectrum*'s version of area magnification, in which you select a small region and work within it. In *Spectrum*, you edit the pixels one color at a time, which means that multicolored detail must be done in several stages. Editing colors is the way to change the colors of a specific object.

Free Spirit explains, at the beginning of the brief (ten-page) manual, how *Spectrum 128* works. Most 64 paint programs use a 160 × 200 pixel resolution, with an 8 × 8 pixel color cell. Four colors can be displayed within each color cell, and a total of 16 can appear on the screen at any one time.

Other programs, such as *geoPaint*, use 320 × 200 high resolution, still with the 8 × 8 pixel color cell. *Spectrum 128*, on the other hand, uses the 128's video

display chip to attain a resolution of 640 × 200 pixels and (just as important) a reduced color cell of 8 × 2 pixels.

This means, of course, much greater control over the appearance of the screen, because the color cells take up proportionally (and actually) much less room. More color cells spread over more pixels means much more possible detail.

Working with these color cells is the heart of the *Spectrum 128* package. The manual makes a big deal of suggesting that the Block Erase function is extremely important in this program, but not until you use it do you realize why.

Choosing Block Erase (from the Paint menu) brings up the color menu. You select a color and then proceed to draw a rectangle of any size on the screen. Click, and you have a rectangle of that color to work with. The importance of this new rectangle is that it is essentially a new background that you can paint on. *Spectrum* uses the 8 × 2 color cell as the basis for this function.

What Block Erase does, then, is let you partition the screen into a variety of background colors. You can then paint on top of these areas as you would normally paint on any background. You can paint directly on it or use Edit Pixels to isolate and magnify a portion of it.

The disadvantage of using Block Erase is that you can't move these rectangles around, but the advantage is that they're much easier to work with than trying to manipulate the rectangles you draw with the Shapes menu. By thinking of your paintings as a series of backgrounds rather than as shapes superimposed on just one background, you will get the picture right much more quickly.

The 8 × 2 color cells are also vital to *Spectrum*'s Multi-Color option. Usually, you will paint from a palette of 16 colors, but Multi-Color gives you 128 colors (they're actually dithered versions of the 16). You use these colors as a kind of low-resolution means of painting in gobs, and they can be incorporated into any *Spectrum* picture.

To display your pictures, *Spectrum 128* includes a slide show. Just insert your data disk (with all your paintings on it) and select Slide Show from the tools menu, and *Spectrum* will load and display all your artwork in succession. In fact, to get an idea of the kind of art possible with this package, simply ask for the slide show of the program disk. Several good-looking screens have been included.

Spectrum 128 allows you to create some impressively detailed paintings. While not offering as much control over technique as you get from programs for machines such as the Amiga or the Atari ST, it is nevertheless a fine 128-based package. If Free Spirit does what it should, adding options and releasing art disks, *Spectrum 128* could become something of a standard for serious 128 users.

It's good to see the 128 being put to work.

—Neil Randall

Spectrum 128
Free Spirit Software
58 Noble St.
Kutztown, PA 19530
$39.95

Jack Nicklaus' Greatest 18 Holes of Major Championship Golf

I had high expectations. Being a longtime golfer and a big fan of golf software, I anxiously awaited Accolade's latest addition to its line of great sports software. Once I read the press release, I was convinced that *Jack Nicklaus' Greatest 18 Holes of Major Championship Golf* would be the best golf simulation ever for the 64. Is it? Yes and no.

Computer golf has been received far better than anyone ever expected, with a list of titles that seems to grow by the month. But only a few can rightfully vie for the title of *Best*. Because of the challenge in programming golf simulations, a majority of the titles available are little more than grotesque renderings of the game. *Jack Nicklaus* meets the challenge and attempts to secure a position at the top by offering some exciting new features.

Is this the best-ever golf simulation for the 64? Yes, but. . . .

Included in the package are a player's guide, a course sheet, and the double-sided game disk. The player's guide is thorough and well written, and it offers several special tips from Jack for improving your computer golf game. Once you've booted the game and selected a course to play, you're introduced to the copy-protection scheme. It's one of the newest forms of protection, sometimes referred to as *soft protection*, where the player must type in a word or sentence that appears on a specific page in the manual. Accolade has added a twist that requires the player to match the number of the hole that appears on the screen to the corresponding number on the course sheet. To deter people from copying the course sheet and "loaning" it to friends, the sheet is printed on dark maroon paper with black ink. Just finding the match could be considered a game in itself—very irritating to your eyes (but not to the disk drive). If you decide to quit a game in progress, you're returned to this initial screen and subjected to the same grueling process.

Once into the game, you see the wide variety of options and unique features in *Jack Nicklaus*. Players can challenge the Golden Bear himself or compete against male or female golfers in traditional stroke format or the recently commercialized skins format. Three championship golf courses are included; Castle Pines, Colorado, and Desert Mountain, Arizona, are both courses designed by Jack Nicklaus, and the third one is comprised of Jack's selection of the 18 greatest holes from the four major championships: the U.S. Open, the PGA Championship, the Masters, and the British Open. The only feature obviously lacking is a course architect.

Among the impressive list of options, the most intriguing to me is the opportunity to play against computerized players. Until *Jack Nicklaus*, no golf game had featured a computer golfer. Now you'll never have to worry about filling out a foursome. Eight golfers (four men and four women) are always there if you need a partner. Each of the golfers has different skills, which are outlined in the player's guide. For instance, Natasha is known as "a big hitter who drives from the men's tees" and Eddie C. has a reputation for "suckering players into a 'friendly' game of skins."

The most prominent golfer in the group is Jack himself, whose skills are patterned after Nicklaus's actual game. He is always a challenging opponent, but sometimes a little too good; even the legendary, real-life Jack couldn't beat computer-clone Jack on the putting green. Don't be surprised if he one-putts every hole.

The addition of a computer-players feature is questionable compensation for the lack of a course editor—in my opinion, a poor tradeoff. The computer-players option is a pioneer idea but excruciatingly slow (approximately 45

minutes per round for each computer golfer). Without the ability to save a game in progress, the feature becomes practically useless.

Several features in *Jack Nicklaus* enhance the realism of the simulation: rolling hills, downhill lies, and random pin placements. Since the flagstick is placed randomly, no hole plays the same way twice. Statistics are conveniently tallied for you after every hole. You're given yardage for your longest drive and for your last drive, plus stats for closest ball to the pin, fairways and greens in regulation, putts taken, and birdies and eagles made. By studying these figures, you can determine your weaknesses and become a better player.

Before play begins, you're given an overhead layout of the hole, complete with distance and par. Pressing the fire button brings up the game screen, where you view the course from behind the golfer. To select the direction of a shot, you move the ball located at the top of the screen. The flagstick is also displayed at the top to help you take better aim.

Located on the left side of the screen is a power bar that gauges each swing. Press the fire button to start your backswing, and the power bar heads upward. Press again to start your downswing, and the power bar follows. The length of your backswing determines the distance the ball travels.

One last press controls when you hit the ball. Striking it early results in a hook (the ball goes to the left); hitting it late will slice the ball (cause it to go to the right).

Once you've become familiar with the controls, you'll find that, in general, the game is much too easy. Wind has only a minimal effect on the ball, and the rough and sand traps aren't the hazards the old golf masters intended them to be.

On the other hand, you're likely to encounter several problems on the putting green. Long putts are more often easier to sink than short putts. More than once I experienced a glitch when trying to tap in; the result resembled a shanked iron shot more than it did a putt. I'm a long-time advocate of difficult putting in commercial golf games, but this lack of realism is not the answer.

Reproducing a golf course with computer graphics can be just as tough as programming the game. Tees, fairways, long and short rough, sand traps, trees, water, and putting greens make up practically every golf course, and portraying them all on one computer screen is next to impossible on the 64. Accolade makes an admirable attempt, but the results appear overdone. On many par 3 holes you have to search to find the green, and without the flagstick indicator, the search would be endless.

First-time computer golfers shouldn't be put off by the criticisms found here. *Jack Nicklaus* is one of the best golf software packages available for the 64, with a vast inventory of good features that overshadow the drawbacks. As in real golf, a couple of good shots erase the bad ones and keep you coming back for more.

—David Hensley, Jr.

Jack Nicklaus' Greatest 18 Holes of Major Championship Golf
Accolade
550 S. Winchester Blvd.
San Jose, CA 95128
$29.95

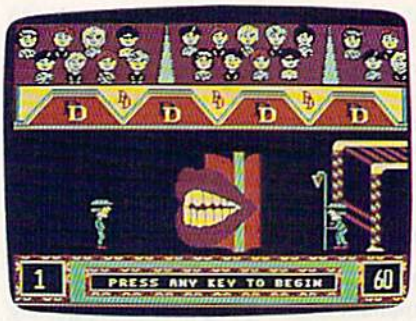
Double Dare and *Hollywood Squares*

Your kids will complain that they don't get messy, and you may complain that you don't get to keep the car. Aside from that, *Double Dare* and *Hollywood Squares*, two games from GameTek, provide almost as much fun as the original television game shows. Like *Wheel of Fortune*, these two games make a surprisingly faithful transition from TV to computer.

Any fan of the TV games will enjoy these thoughtfully rendered computer versions.

Hollywood Squares introduces you to a panel of celebrities who come prepared with quips and gag lines to help you win (or lose) this dandified version of tic-tac-toe. On certain rounds there's even a Secret Square with a bonus prize. The trivia questions used in this game are typical fare—sometimes deep, not always easy, but always primed for humor. For instance: "It is defined as a puzzling question or an enigma, which is to be solved by guessing. . . . What is it?" Humorous response: "Finding a bra in your husband's lunch box." Star's actual answer: "A riddle."

It's obvious someone worked hard to make the computer version of *Hollywood Squares* as much fun as the TV show. In addition to the questions, answers, and wisecracks, the animation is also good. Our only criticism is that the screen-clearing routine seems to take forever. Still, don't let that bother you. *Hollywood Squares* is the laid-back sort



Double Dare

Alex's question:
According to the "World Book," what is the only important difference between a peach and a nectarine?
Alex's reaction:
The spelling...
Press a key for Alex's answer!

Hollywood Squares

of trivia game that finds a comfortable place at a party or get-together where you don't pay constant attention anyway.

Double Dare—for those of you without kids—is based on a recently created game show that combines trivia questions with the reliable capacity children have for getting one another in trouble and the usually taboo fun of getting incredibly messy.

Contestants have the choice of answering a question or daring an opposing two-person team to answer. If that team dares back, you must answer or take a Physical Challenge. In the TV version, a challenge may consist of throwing wet sponges into a bucket until it is heavy enough to tip a second bucket of gooey syrup onto your partner's head.

While the computer version doesn't provide opportunities for such personal messiness, it does require dexterity as you face various arcade challenges. Timing, in particular, plays a big factor toward success.

At the end of a game, the winning team faces an obstacle course. This is where arcade skills really count. While TV players cope with a mess, computer contestants face the frustration of not being able to get anywhere. To make it tougher, the devious minds behind this game have decreed that forward on the joystick is right and backward is left, left is back and right is forward—kind of like adding a blindfold to a live challenge, just to make it harder.

The trivia questions in *Double Dare* range from old TV shows to modern music to current events, and while some Physical Challenges are easy, others are impossible. The best way to play this game is in pairs—with one smart player providing reliable answers to the trivia and someone adept at arcade games handling the challenges.

Animation here is quite good, particularly the obstacle-course sequence. The obstacles are straight from TV, and the graphics are terrific. When the clock counts down during a question, the contestants' facial expressions are great.

We also liked the way the program lets you choose your screen persona. Cycle through four different possibilities until you find one you like. Actually, both programs make note of a player's gender, so appropriate graphics appear onscreen.

Be careful to follow the instructions exactly when loading the game. Don't include the ,1 most commercial programs require. It will sabotage the load. Both programs work fine with FastLoad. This is especially helpful with *Double Dare*.

We were most impressed with the dedication to details and by the way producers maintained the original game formats. Where many programs adapted from another medium skimp on rules, method, or prizes, these two do not. Any fan of the TV games will enjoy these 64 versions. And even if you're not a fan, we think you'll get a kick out of these games anyway.

—David & Robin Minnick

Hollywood Squares
Double Dare
GameTek
2999 NE 191 St.
Suite 800
North Miami Beach, FL 33180
$14.95 each

Powerplay Hockey: USA vs. USSR

At the risk of alienating true hockey fans (who seem to make up about one-half the population of the United States and Canada), I'm going to say it: I've always suspected a good portion of your enjoyment of the game comes first in anticipating and then in watching the inevitable fisticuffs. There—I've said it.

When a fight broke out the first time I played *Powerplay Hockey*, I knew Electronic Arts had given the game a legitimacy it could have acquired in no other way.

You don't have to be told that ice hockey is a fast game, but you should know that this version of the game, which pits the U.S. against the U.S.S.R, sacrifices nothing in speed. To me, watching the monitor and trying to keep track of the puck is like watching a televised game of hockey.

The camera pans across the ice swiftly and smoothly, sometimes leaving behind players who either are slow or have foolishly skated off in the wrong direction. The puck and the players move as though they're on real ice and follow the rules of the real game.

Controlled by either the computer or a friend, your opponent is the Russian hockey team. (You remember them—at the Lake Placid Olympics, they learned to believe in miracles.) The game has three difficulty levels.

You can play one-on-one or have full teams of five on the ice. Either way, you control only the center, taking the face-offs and leading the attacks. In the one-on-one game, your opponent is the center until you gain control of the puck; then the computer controls the goalie. The computer always controls your goalie.

In the full-team game, the same controls apply. The wings and the defensemen on both sides are controlled by the computer. They do their jobs to

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If offering free software is what it takes for you to try our GEOS products on your Commodore, then by golly, we're prepared to do it. Just buy any GEOS product from your local Commodore dealer and follow the directions on the form below.

For every GEOS product you buy, we'll send you one of equal or lesser value absolutely free. Which means you can build an integrated library for half the cost.

But hurry. This offer expires August 15, 1989. After that, we may not be feeling so generous.

OH, ALRIGHT!

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REDEMPTION INSTRUCTIONS

To redeem this offer for a free product of equal or lesser value do the following:
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GROUP I
geoChart: Transforms complex numerical data into any of 9 easy-to-understand graphical charts.
DeskPack Plus: Calendar, card file, mail merge, blackjack game and also imports clip art. In 40 and 80 columns.
FontPack Plus: 53 fonts in multiple point sizes plus a font editor to create or modify fonts. Operates in 40 and 80 columns.
geoSpell: Spell checks GEOS documents.

GROUP II
geoPublish: Desktop publisher that creates up to 7' x 9' posters, 192 point type and vertical text; resizes graphics and more!
geoFile: Graphics-based database available. Also for 80 column Commodore 128 computers.
geoCalc: Versatile integrated spreadsheet. Also available for 80 column Commodore 128 computers.

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GEOS 2.0: Word processor, graphics workshop, spell checker file and disk manager, mail merge program, desk accessories and more!
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geoFile 128: Graphic-based database in 80 columns.
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3. Collect the following items:
- This coupon with all the information filled in completely.
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- A check or money order made out to Berkeley Softworks for US $4.50 to cover shipping and handling. Please do not send cash.

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Berkeley Softworks
Attn: FREE SOFTWARE OFFER
2150 Shattuck Avenue
Berkeley, CA 94704
5. Offer good from May 15, 1989 through August 15, 1989.
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2ND CHOICE B

the best of their abilities—unless you mess up.

Even if you do mess up, the team can play almost as well without you. While it's difficult to keep track of the center in a team game, the team is perfectly capable of stealing the puck, passing it down the ice, and attempting goals.

You'll want to watch your team for signs of fatigue. On the score/penalty board at the top of the screen, a shrinking line tracks its stamina. You can choose one of three teams: one good on offense, one good on defense, and one balanced.

As the team leader, you'll have to take the bitter with the sweet. If a penalty is called, you're the one who sits in the penalty box. Penalties occur for the usual reasons: roughing and cross-checking. Other defensive moves you may enjoy are body checks, poke checks, and slide blocks. Of the three, body checking seems the easiest way to start a fight and end up in the penalty box.

You control the game with the joystick and fire button. There are quite a few combinations you'll have to remember in order to execute both offensive and defensive moves. No matter; learning is part of the fun.

As in any hockey game, the action lasts for three periods. In this case, you can select periods of 2, 8, or 20 minutes. Though the length of a penalty period increases in proportion to the length of the period, it doesn't matter much in a one-on-one game. In a one-on-one game, the action freezes for a moment and then you face off in the circle nearest the goal you're defending.

At the end of each period, the screen shows the statistics (shots and goals) for each player. At the end of the final period, you see the statistics for the entire game and know whether you've lost or handed the Russian team yet another miracle.

As a semi-reward, statistic screens are accompanied by the appropriate national music ("Yankee Doodle Dandy" plays when the U.S. is ahead). At the end of the game, a typical cityscape from the winning country appears on the screen along with a congratulatory message.

The documentation for *Powerplay Hockey* is brief but good. Even those who are not hockey fans will soon understand the rules. For example, none of my friends who are true-blue fans have ever been able to explain what *icing the puck* means. Yet after only a few games, my son could explain it.

Watching the screen is like watching a televised game of hockey.

I should note that the documentation occupies a single large sheet. On the reverse side is a mini-poster showing the ultimate captain of the Red team. His nickname is Gorby. You'll recognize the fellow even though you're not used to seeing him in his team helmet.

—Ervin Bobo

Powerplay Hockey: USA vs. USSR
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
$24.95

Calculator 128

Calculator 128 isn't *Mathematica*, but then that particular piece of software probably will never be ported to the Commodore 128 and 64. It isn't a spreadsheet, either. What you'll find in this simple, yet comprehensive program is a practical calculator capable of assisting with the family budget as well as providing useful calculating capabilities for students in physics, trigonometry, and electronics.

Despite its name, *Calculator 128* will run equally well on the Commodore 64. It is one of those rare commercial products without copy protection and written entirely in BASIC. Since it's so open to inspection, the package offers student programmers the opportunity to see the sorts of professionally written algorithms that go into a financial and trigonometric calculator. (When you load the program into memory, you'll probably want to correct a spelling error on line 315 where *reciprocal* is spelled *riciprocal*. On the other hand, maybe that sort of thing only drives editors crazy. If so, forget I mentioned it.)

Calculator 128 can figure out loan payments, prompting you for selling price, sales tax, insurance, and other costs, down payment, interest rate, and number of monthly payments. After a second or two of calculation, it provides you with an estimated monthly payment. The program offers the warning that interest rates are calculated in many different ways and that the answer provided by *Calculator 128* is only an estimate.

The program provides a conversion utility that converts between Celsius and Fahrenheit; millimeters and inches; meters and inches, feet, or yards; kilometers and miles; cubic centimeters and cubic inches; cubic meters and cubic feet; milligrams and grains; kilograms and pounds; liters and gallons; watts and horsepower; pounds and gallons of water; and a long list of more complex conversions such as translating liters per second to gallons per minute.

The publisher suggests that this software will assist with statistical calculations. Although the calculator has a "memory" feature, it's no more involved than the memory of a simple hand-held calculator available for a few dollars. *Calculator 128* can't by itself calculate chi squares or standard deviation. In fact, for most simple math problems, you would be hard-pressed to find a calculator more powerful than the immediate mode of the 64 or 128. For much more complex mathematics involving control groups and population studies, you should purchase a spreadsheet like *Excel* and a Mac or an AT clone to run it.

A simple yet comprehensive program that will help students in physics, trigonometry, and electronics—as well as the person doing the family budget.

For the intermediate-level user, the student of trigonometry, the salesperson trying to figure out income, anyone who often makes conversions between U.S. and foreign measurements, the potential home buyer trying to decide whether he or she can afford a house of a given price, or the student programmer interested in seeing how this sort of program is put together, *Calculator 128* is worth a look.

—Robert Bixby

Calculator 128
Educational Software
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Amarillo, Texas 79109
$9.95

G

MINE SWEEPER

Ben Campbell

Arcade action at its best! This game's frantic pace will keep you riveted to the screen for hours. For the 64. Joystick required.

You've received a message that Tyrabian mine layers have been spotted just outside the Earth's atmosphere. Intelligence reports indicate that the Tyrabians intend to conquer the planet without destroying it. The first wave of attack will attempt to destroy major military installations. The second wave will shut down the planet's major power stations. The third wave will crush any remaining pockets of resistance.

You're the commander of the interceptor base in the Gamma quadrant. As such, it's your job to see that the Gamma power station remains online and operational. Failure could lead to the Earth's destruction. You have nine Sigma V remote-control drone ships. The drones are equipped with the latest in impulse-laser technology. From the interceptor control tower overlooking the power station, you must destroy first the Tyrabian mines and then the mine layer itself. Five sectors (blue, yellow, white, green, and red) must be cleared before the power station will be safe.

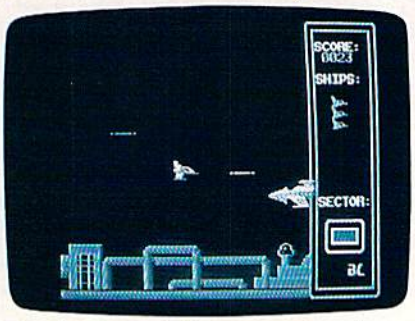
Typing It In

Mine Sweeper is written entirely in machine language, so you'll need to use "MLX," the machine language entry program found elsewhere in this issue, to enter it. The MLX prompts, and the values you should type in, are as follows:

Starting address: 0801
Ending address: 2468

Be sure to save a copy of the program before exiting from MLX. Mine Sweeper can be loaded and run like a BASIC program. To start the game, load Mine Sweeper and type RUN.

The opening screen is filled with the view from the remote viewer in the control tower. Initially, the viewer looks out over the power station. On the right side of the display, from bottom to top, are indicators for the current sector, the number of drone ships remaining in your arsenal, and your score.



It takes several shots to get past the mine layer in this fast-action arcade challenge.

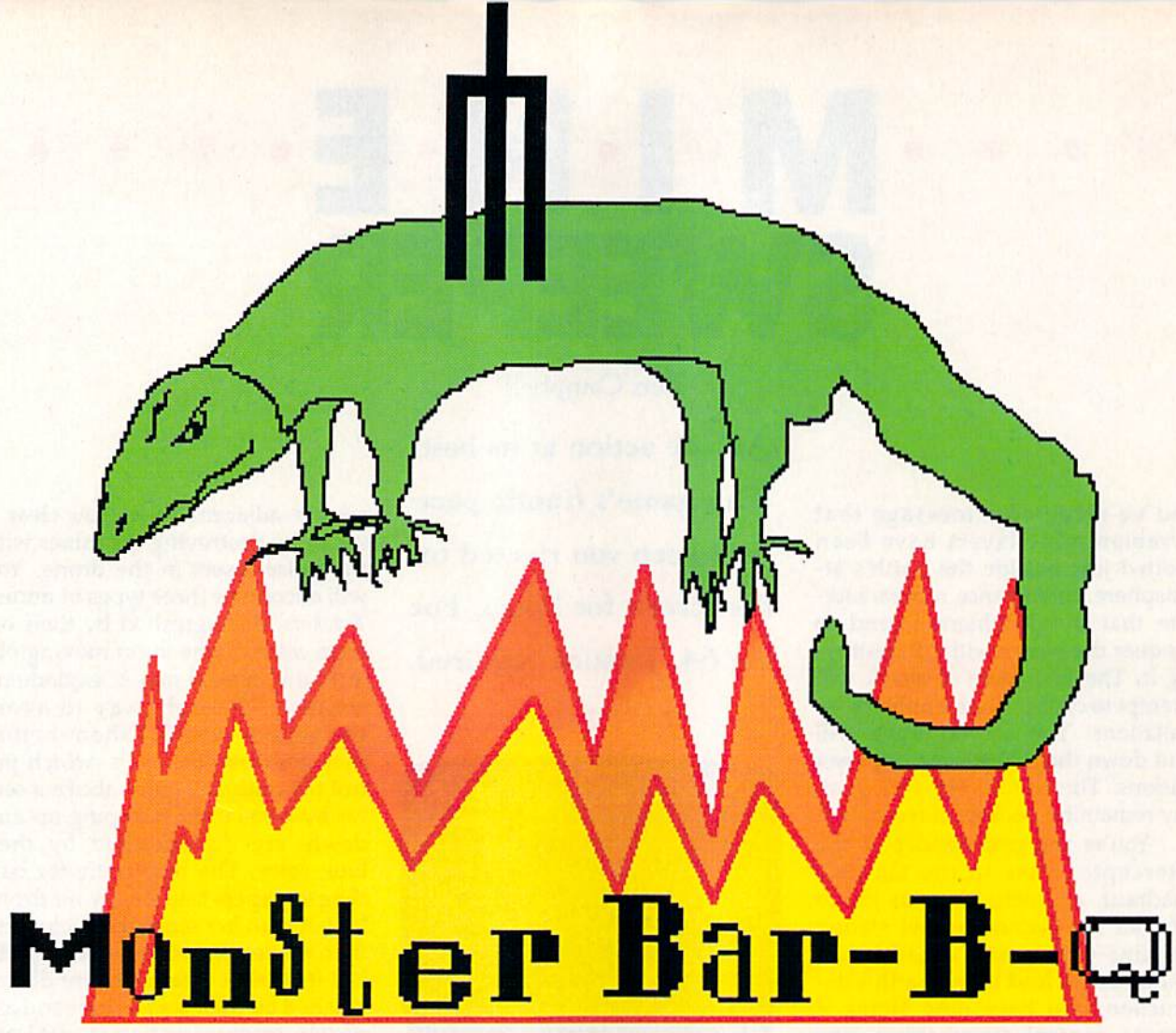
Press the fire button to begin and the first drone ship appears in the center of the viewer. The remote viewer always remains centered on the currently active drone ship. When you move the joystick left or right, the ship turns left or right, respectively, but remains centered in the display. When you move the joystick up or down, the ship moves vertically within the display. Pressing the joystick button fires the pulse lasers. Holding down the joystick button causes the pulse lasers to fire rapidly, but the drain on the drone's power plant is so great that your maneuverability is severely depleted.

To save the power station, you must clear the mines from the five sectors adjacent to it. You clear a sector by destroying the mines with the pulse lasers in the drone. You will encounter three types of mines. *Trackers,* distinguished by their orange color, home in on moving objects and, like all mines, explode on contact. The only way to avoid trackers is to shoot them before they get close. *Sweepers,* which patrol the entire airspace above a sector by constantly sweeping up and down, are distinguished by their blue color. The best tactic for battling sweepers is to keep your drone low. A *searcher* scans the sector and then moves directly toward any object it detects. Searchers are distinguished by their green color and are nearly impervious to frontal assault; the best way to fight them is to dodge and attack from behind.

Once all the mines in the sector have been destroyed, the mine layer must be destroyed. Mine layers have a pulse laser much like the one in the drone ships. This laser is an older model and can't fire as rapidly as a drone's can, but it's powerful enough to destroy a drone with only one hit. Mine layers are protected by a powerful force field. Each time you hit one with your pulse laser, the field is weakened, but it's constantly renewed by the mine layers' engines. You'll have to hit it many times to bring it down. If your drone is destroyed, the mine layers' force field regenerates to full power before you can activate a new drone.

You must clear the blue, yellow, white, green, and red sectors in order to save the power station. Periodically (every 50 points), a new drone ship is prepared for activation. You'll need as many drones as you can muster to save the power station.

See program listing on page 72. **G**



Charming graphics highlight this novel game for kids of all ages. For the Commodore 128. Joystick required.

Cullen O'Day

What would you do if you lived on the edge of a cemetery and your backyard was invaded every night by hungry ghouls and goblins? You'd fire up the old barbecue pit, that's what!

Monster Bar-B-Q takes place in your backyard cemetery. In the foreground are three rows of tombstones and the crosshairs for your special ghoul zapper. In the background stands your home, with its illuminated windows. On a tree branch rests a sleepless owl—blinking its eyes while observing the ruckus below. Lightning strikes and thunder rolls to signal the start of the game.

Using the tombstones for cover, a variety of dreadful monsters pop up and down. These ghouls include the Vampire, Wolfman, Creature, Monster, Mummy, Red Devil, and, last but not least, Red Skeleton (sic!).

With your joystick plugged into port 2, position the crosshairs over any monster's face; then press the fire button to vaporize the beast. The crosshairs of your ghoul zapper can move diagonally and wrap around at the screen's edge. Make use of these features; later in the game, those monsters don't stick around very long.

Scoring is straightforward. Each monster you zap gives you 100 points. Escaping monsters costs you 150 points; misses cost you 50 points.

There are five rounds in the game. A flash of lightning signals the beginning of each round. As you advance through the rounds, the monsters appear and disappear more quickly. The game ends when you've played five rounds or when the total number of misses and escaped monsters exceeds 10.

Fire up the barbecue—the monsters are back!

Typing It In

Monster Bar-B-Q is written in BASIC 7.0. To prevent typing mistakes, use "The Automatic Proofreader," found elsewhere in this issue, when entering the program. Once you've finished typing the program, be sure to save a copy to disk or tape before you run it. **G**

See program listing on page 81.

M×A÷T+H
M÷A+G×I=C

Michael Kaelin

An arcade-style math game? That's "Math Magic," a clever educational tool for children 5–9 years of age. For the Commodore 128 with a joystick.

Let's set the scenario: A wizard hands you a crossbow. Suddenly, a math problem appears. In front of you, there are four colored boxes with numbers inside. The wizard expects you to shoot an arrow at the box that contains the correct answer. You take aim and release. Bulls-eye! You've hit the target! With a puff of smoke, the problem disappears. You never knew math could be so much fun.

Getting Started

"Math Magic" is written in 128 BASIC. Type in and save the program. Be sure to use "The Automatic Proofreader," found elsewhere in this issue, to ensure that you don't make any typing mistakes.

To play Math Magic, load the program, plug a joystick into port 2, and type RUN. A menu screen will appear. Select the type of problems you want to practice. Your choices, numbered 1–4, are addition, subtraction, multiplication, and division.

Next, choose a level of difficulty (1–13) and press RETURN. Level 1 is the easiest; level 13, the most difficult.

After you've entered your choices, the playing field appears. To your right is the wizard with a math problem beside him. Above your crossbow are four colored boxes with numbers inside.

Using your joystick, position the crossbow under the box with the correct answer to the problem and press the fire button. If you're right, you're awarded ten points and a new math problem appears. If you're wrong, the problem remains on the screen until you correctly answer it.

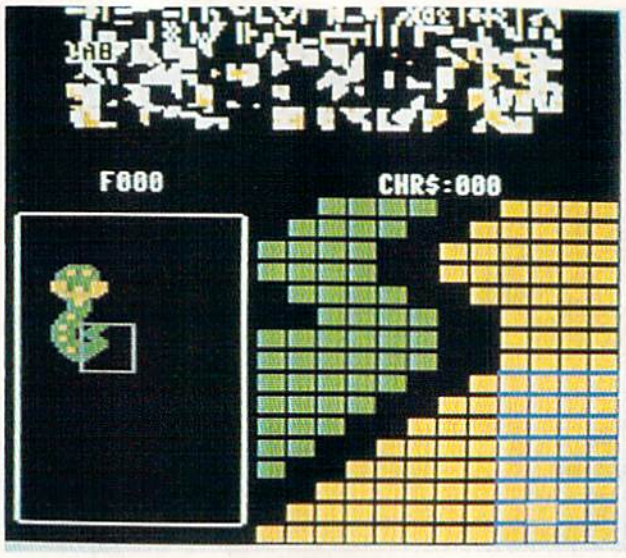
Good marksmanship and even better arithmetic skills are the keys to success in this educational game for children.

If you answer five problems correctly within one minute, you advance to the next level. The green, yellow, and red bar at the bottom of the screen helps you keep track of how much time remains. If the time expires before you complete the level, the game ends. You win the game by advancing through level 13.

String up your crossbow and grab your arrows because there are problems to solve. Who knows? The wizard may perform a little math magic and turn you into a real math wiz.

See program listing on page 79. **G**

```
 57
+85
---
142
```



The "CHR$ Graphics" editor automatically redefines the 64's character set when you create your multicolor drawings.

CHR$ Graphics

Hubert Cross

You've never had this much control over your graphics characters. With this utility, you can design and animate large multicolor images—up to 112 × 112 pixels—all from BASIC. For the 64. Joystick and disk drive required.

"CHR$ Graphics" is a graphics editor of a different sort. It uses redefined characters to generate shapes, but the images you design are not limited to an 8 × 8 pixel area—they can be up to 112 × 112 pixels (14 × 14 characters) in size. You can design as many as 256 of these images. The editor allows you to flip your images, shift them in any direction, and save them to disk. CHR$ Graphics makes creating complex character graphics as easy as using a good sprite editor.

To help you use the graphics that you design, CHR$ Graphics adds six commands to BASIC for loading, saving, placing, and erasing your shapes. Once CHR$ Graphics is in memory, both the shape editor and extra commands are accessible, providing an effective, all-in-one graphics development system.

Getting Started

Program 1, CHR$ Graphics, and Programs 2 and 3 are written entirely in machine language, so use "MLX," found elsewhere in this issue, when you enter these programs. When prompted by MLX, respond with the values given below.

Program 1

Starting address:	**$7C00**
Ending address:	**$903F**

Program 2

Starting address:	**$3F90**
Ending address:	**$405F**

Program 3

Starting address:	**$3C10**
Ending address:	**$41AF**

After you've typed in all the data, be sure to save a copy to disk before leaving MLX. Save Program 1 with the name CHR GRAPHICS, Program 2 with the name DEMO .FILE1, and Program 3 with the name DEMO.FILE2.

Program 4 is written in BASIC. Use "The Automatic Proofreader," also found in this issue, to type it in; then save it with the name DEMO. Before you begin typing, you must load Program 1 and activate it with the command SYS 31744. When you finish entering the demo, be sure to save a copy to disk. After saving the demo program, run it to get an idea of how powerful CHR$ Graphics is. Although the demo is 25 lines long, the actual work of drawing and erasing images is done in just 8 lines of code.

The Editor

CHR$ Graphics' editor is where you design custom character graphics for your programs. Plug a joy-

stick into port 2; type LOAD "CHR GRAPHICS",8,1; and then type SYS 31744 to enable CHR$ Graphics. Type the command EDITOR to activate CHR$ Graphics' image editor. The editor initially starts in multicolor mode with a white border and a black background. A 14 × 14 character box appears in the lower left corner of the screen. The images you design are displayed full-size in this box. Note the characters at the top of the screen. As you create your images, you'll see these characters being redefined.

To the right of the character box is a grid showing a magnified portion of your image. A small blue rectangle in the grid outlines the character being redefined. Because CHR$ Graphics starts in multicolor mode, characters are 4 pixels wide × 8 pixels high. When in hi-res mode, characters are 8 pixels wide × 8 pixels high. Since multicolor pixels are twice as wide as hi-res pixels, the character width remains the same no matter which mode you are in. Press M to toggle between multicolor mode and high-resolution mode.

Use the joystick to move the cursor. To quickly move to the upper right corner, press CLR/HOME. To fill in a square, use the joystick to move the cursor to the square and then press the fire button. Pressing the fire button acts as a toggle: Press the fire button once to fill a square; press the fire button again to clear the square.

While in the editor, you may find the cursor moves too fast or too slow. You may adjust the speed of the cursor by pressing any of the number keys at the top of the keyboard. Press 0 to make the cursor move as fast as possible; press 9 to make the cursor move as slowly as possible. Use the cursor keys to move the cursor one character at a time.

CHR$ Graphics contains 256 frames, with one image per frame. The number of the current frame is displayed above the character box. An uppercase *F* (for *Frame*) appears just before the number. You'll need to keep track of the frame number in order to recall the shape from within a program.

As you design shapes, CHR$ Graphics' editor automatically redefines characters to create the image that you draw. The ASCII value of the character being redefined is displayed above the grid. You do not need to know this number to use the program; it is there simply for your convenience. Initially, empty areas of your drawing are represented by *null* characters (those with an ASCII value of 0). Unlike spaces (ASCII 32), null characters are not drawn when an image is stamped to the screen.

Colors

In multicolor mode, characters are drawn using three colors (pens). Select a pen using the function keys. Press f3, f5, or f7 to select pen 1, 2, or 3, respectively. To change the color of the active pen, press either the Commodore or the CTRL key together with one of the color keys at the top of the keyboard. Note that there are only eight colors available for pen 3—black through yellow (CTRL-1 through CTRL-8). Also, whenever you change the color of a pen, every pixel drawn with that pen changes color as well.

Press B to increment the background color. When you change the background color, the color of the character set at the top of the screen changes to a color having a good contrast with the new background color. Press SHIFT-B to decrement the background color.

Press G to increment the grid color; press SHIFT-G to decrement the grid color. In multicolor mode there are only eight colors available for the grid. Press S to increment the color of the sprite that highlights the current character on the grid. Press SHIFT-S to decrement the color of the sprite.

You have full-color control in multicolor mode only. In hi-res mode, the only active pen is pen 3, so you can have only one foreground color per character. Hi-res mode offers twice as many pixels per character, however.

Emptying the Garbage

Perhaps the editor's most helpful feature is its ability to eliminate unused and duplicate character definitions. In CHR$ Graphics, this is known as *garbage collection*. With a little thrift and the help of this garbage collection, you'll be able to get the most out of the 196 redefinable characters available.

As you draw your images, you can see how the characters at the top of the screen are redefined. To see how garbage collection works, draw a long, straight line from the left border all the way to the right. As you draw the line, you'll notice the characters at the top of the screen being redefined to display the line.

After the line has been drawn, press C to force CHR$ Graphics to perform garbage collection. CHR$ Graphics displays the message GARBAGE COLLECT during this process. Carefully watch what happens. Your image doesn't change shape, but you'll notice several duplicated characters reappearing at the top of the screen.

In addition to eliminating duplicate character definitions, garbage collection also disposes of empty characters. (An empty character is a character that has nothing drawn in it.)

Shifty Images

CHR$ Graphics is capable of shifting your image by characters or by pixels. Press U to shift the image up one character; press D to shift the image down one character. The L and the R keys shift the image one character left and right, respectively. The image stops when it reaches a border.

To shift the image one pixel at a time, hold down SHIFT while using the keys mentioned above. For example, SHIFT-U shifts the image one pixel up. SHIFT-D, SHIFT-L, and SHIFT-R shift the image one pixel down, left, or right, respectively. In multicolor mode, pen color 3 is left behind when you move an image. This is a hardware limitation. Usually, you will have to retouch color 3 after shifting an image.

Press F to flip the image horizontally; press SHIFT-F to flip it vertically.

Depending on the number and complexity of your shapes, you may run out of characters when you try to shift or flip an image. If so, CHR$ Graphics does some internal garbage collection. If there are not enough characters left after the garbage collection, CHR$ Graphics issues an OUT OF CHRS message and leaves the image unchanged.

If an image has not reached the border, yet it does not move when you try to shift it in that direction, there is an empty character in your way. To see it, press f1. Unused

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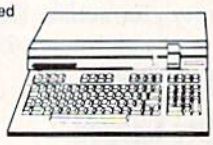

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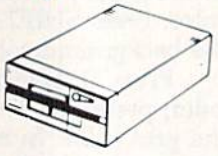

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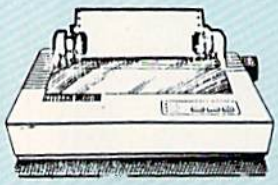
CITIZEN

Citizen 120-D



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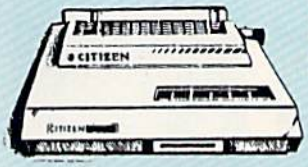

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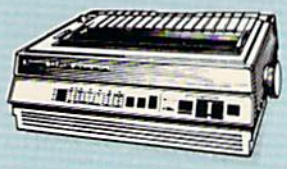

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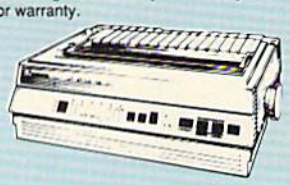

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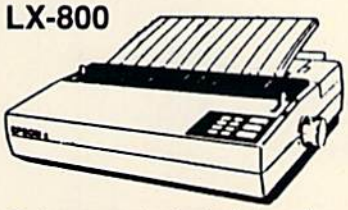
LX-800



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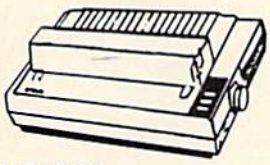

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24-pin quality

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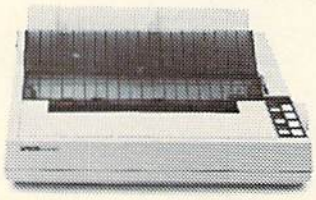

Epson's FX printers are legendary in the computer products industry. The FX-850 continues Epson's long tradition of quality, performance and reliability. It prints at 264 cps in draft mode and 54 cps NLQ - insulated for quiet operation. Like all Epson computer products, the FX-850 printer is supported by a nationwide service network and backed by Epson's 1-year limited warranty.

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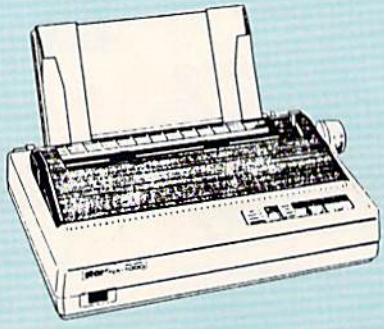

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Editor Command Summary

0–9	Set cursor speed
f3	Select pen 1
f5	Select pen 2
f7	Select pen 3
f1	Highlight null characters
CTRL/Commodore 0–9	Change active pen color
U	Shift image one character up
D	Shift image one character down
L	Shift image one character left
R	Shift image one character right
F	Flip image horizontally
C	Garbage collection (also clears buffers)
B	Increment background color
G	Increment grid color
S	Increment sprite color
M	Toggle between hi-res and multicolor mode
I	Copy image to buffer
O	Copy image from buffer to current frame
↑	Copy current character into minibuffer
*	Copy character from minibuffer to current character
CLR/HOME	Moves the cursor to the top left corner
SHIFT-U	Shift image one pixel up
SHIFT-D	Shift image one pixel down
SHIFT-L	Shift image one pixel left
SHIFT-R	Shift image one pixel right
SHIFT-F	Flip image vertically
SHIFT-B	Decrement background color
SHIFT-G	Decrement grid color
SHIFT-S	Decrement sprite color
SHIFT-CLR/HOME	Erase current image
INST/DEL	Delete current frame
SHIFT-INST/DEL	Insert new frame
£	Null current character
SPACE BAR	Clear current character
+	Move to next frame
−	Move to previous frame
N	Jump to selected frame
RUN/STOP	Exit to BASIC

NEW BASIC COMMANDS

STAMP *n,x,y*	Draws an image on the screen
ERASE *n,x,y*	Erases an image on the screen
DLOAD *"filename"*	Loads an image file from disk
DSAVE *"filename"*	Saves an image file to disk
CLEAR	Erases images from memory
MULTIC *mc1,mc2*	Sets the multicolor pen colors

characters are displayed with a checkerboard pattern, while empty characters appear as spaces. Press C to remove empty characters; then press f1 to return to the normal display.

Animation

To animate your shapes, you'll need to create an image, copy it to the next frame, make changes to it, copy the new image to the next frame, and so on. This is a difficult task to do by hand. Fortunately, CHR$ Graphics handles most of the work for you.

To move to the next frame, press the + key. The − key moves you to the previous frame. To move quickly to distant frames, press N. CHR$ Graphics prompts you for a frame number. Type in the frame number. Notice how the frame number's digits rotate right to left. CHR$ Graphics always displays the frame that corresponds to this number. For example, let's say you're viewing frame 216 and wish to move to frame 67. Press N and begin entering the numbers 6 and 7. As you enter the numbers, CHR$ Graphics briefly displays frame 166 and then frame 67. Press a non-numeric key, such as RETURN, when you're satisfied with the current frame.

Copying the image to another frame is done by using a buffer. The buffer is just a temporary storage place for an image while you move to another frame. To copy an image to the buffer, press I. To retrieve an image from the buffer, press O. For example, to copy an image from frame 5 to frame 6, move the cursor to frame 5. Press I to store the image to the buffer; then press the + key to move to frame 6. Press O to retrieve the image from the buffer and then store it in frame 6.

In addition to the image buffer, CHR$ Graphics has a smaller character buffer. Press ↑ to save the character the cursor is in to the character buffer. The contents of the character buffer is displayed over the top left corner of the image. Press * to copy the character from the character buffer to the character the cursor is in.

Note that both the image and character buffers are cleared when garbage collection occurs. Also, when using the buffer, be careful not to copy part of a multicolor frame into a high-resolution frame. This would confuse the program.

To test your animation, hold down the + or − key to quickly flip through each frame. This should give you a good idea of what the animation will look like in a program.

Erasing the Image

CHR$ Graphics provides a variety of commands for erasing, deleting, and inserting images. Press £ to erase the character the cursor is in. Press the space bar to copy a space to the character the cursor is in. (Spaces may be useful later when you use your image within a program. Unlike null characters, spaces are actually copied to the screen by CHR$ Graphics' STAMP command, discussed later. This way, spaces help erase whatever was previously on the screen.)

Press SHIFT-CLR/HOME to erase the current image and leave it blank. If you want to get rid of the image frame altogether, press DEL. This deletes the current frame and renumbers the rest of the frames to fill the gap left by the deleted frame. To insert a new frame, press SHIFT-INST/DEL. The other frames are renumbered to make room for the new frame. Use this command with care, because the image in frame 255 will be lost.

Errors

In addition to the OUT OF CHRS error mentioned previously, you may also get an OUT OF MEMORY error if there is no more room in CHR$ Graphics' internal storage area to add another frame. If you

get this error, you'll have to delete a frame or press RUN/STOP to return to BASIC. With over 15,000 bytes of available memory, OUT OF MEMORY errors are rare.

Press RUN/STOP to return to BASIC. Don't panic if you can't see the cursor! You may have redefined one of the reversed characters used to display the cursor when you designed a frame. It's a good idea to press C to force garbage collection before leaving the editor. This will make the invisible-cursor problem less frequent.

BASIC Commands

Once your images have been created, you're ready to use them in your programs. CHR$ Graphics adds six BASIC commands to make this easy.

The command **STAMP** *n,x,y* draws an image on the screen, where *n* is the image's frame number, *x* is the column number (0–39) of the upper left corner of the image, and *y* is the row number (0–24) of the upper left corner of the image. If you use coordinates outside the legal ranges, CHR$ Graphics ignores that command. While testing your images, use the command **STAMP** *n*,0,0 to make sure that your image appears on the screen.

The command to erase an image from the screen is **ERASE** *n,x,y*. As with the **STAMP** command, *n* is the image's frame number, *x* is its column position, and *y* is its row position. The image is erased by stamping spaces over it.

The **DSAVE** command saves your image definitions. Its format is **DSAVE** *"filename"*, where *filename* is the name of the file the definitions will be saved to. The command to load an image-definition file from disk is **DLOAD**. Its format is **DLOAD** *"filename"*, where *filename* is the name of the image-definition file to load.

The **CLEAR** command discards all image definitions. Use it only when you've saved the definitions or when you want to start over. *Images cannot be "unCLEARed."*

The last command CHR$ Graphics adds to BASIC is the **MULTIC** command. **MULTIC** sets background colors 1 and 2 for multicolor mode. Its syntax is **MULTIC mc1,mc2**, where *mc1* is background color 1 and *mc2* is background color 2.

Examine CHR$ Graphics' demo program, Program 4, to see how many of these commands may be put to use.

Hints and Tips

CHR$ Graphics is limited to using 196 redefined characters. Occasionally, you may need more than this. For example, you may be working on a game with many animated characters and levels. This problem can be solved by creating a different character set for each level of the game. Since a CHR$ Graphics file is relatively small, a new character set can be quickly loaded using the **DLOAD** command.

By default, CHR$ Graphics works in multicolor mode, which allows you to use both hi-res and multicolor graphics; the only price you pay is that instead of having 16 colors available, you have 8. If you'd prefer to work in hi-res mode exclusively so you can access all 16 of the 64's colors, load CHR$ Graphics and enter this line:

```
POKE 2210,200
```

Now when you type SYS 31744, you'll have access to all 16 colors, but the f3, f5, f7, and M keys will be disabled.

See program listings on page 76. **G**

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FINANCIAL PLANNER

Editor's Choice

Need some help sorting out your finances? This versatile and powerful program for the 64 may provide the answers you've been looking for.

In the last ten years, the world of personal finance has become increasingly complex. Almost daily, you face tough financial questions: How much of your paycheck should you save? Should you *buy* or *lease* a car? How much can you afford in monthly payments for a new car? How much life insurance should you carry? Are you saving enough for your children's college education? What kind of mortgage—fixed or adjustable rate—is right for you? Should you refinance your mortgage? Should you deposit money in an IRA this year?

Questions like these often require the opinion of an expert. However, with "Financial Planner," you may be able to get some answers without having to consult a financial analyst. Not only does this comprehensive program perform a variety of common financial calculations, but it also features a built-in calculator for quick figuring or for what-if projections.

Getting Started

Financial Planner is written entirely in BASIC, so be sure to use "The Automatic Proofreader," found elsewhere in this issue, when typing it in. Although the program is fairly long—just over 21K—it's divided into modules so that you can type in only the parts you need. The only requirement is that you include lines 10–1950, which contain the main menu, the built-in calculator, and some common subroutines.

When you run the program, a menu of eight options appears; each option has its own module. To help you determine which modules to type in, an overview of each is presented below. If you read the description of a module and then decide you don't need it, replace the first line of the module (which reads REM—) with the line GOTO 400.

For example, suppose you're not interested in the College Planning module (lines 2000–2999). To prevent it from being accessed from the menu, enter line 2000 as

```
2000 GOTO 400
```

Then continue typing with the next module. The line numbers are listed as x000–x999 to help the user remember them. The actual line numbers will be different. For example, the College Planning module actually runs from 2000 to 2340.

Following are the eight menu options offered by the program.

1. College Planning (lines 2000–2999). Calculates the amount you need to save each year to pay for your child's education. Also determines the total amount you could set aside today to pay for the future cost of college.

2. Car Buy/Lease (lines 3000–3999). Determines how much it really costs you to finance or lease a car over the same period. Also helps you compare a rebate to a lower finance rate. Outputs total costs and real costs adjusted for inflation. Displays the monthly payment when you finance.

3. Compound Interest/Savings (lines 4000–4999). Helps you plan your savings. Determines how long and how much you have to save each month to have enough for that trip to Europe. Calculates any one of five variables (present value, monthly addition, annual yield, number of years, and future value) when you enter the other four.

4. Loan Payments (lines 5000–5999). Lets you figure out whether you can afford a new car. Apartment dwellers can see how much house they can buy with the money currently going toward rent. Helps you identify any hidden charges (like life insurance) tagged onto a prospective loan. Calculates any one of four variables (amount borrowed, interest rate, number of monthly payments, and monthly payment) when given the other three.

5. Fixed/Adjustable Rate Mortgage (lines 6000–6999). Designed for home buyers, this module helps you decide which type of mortgage is right for you. Adjustable rate mortgages, or *ARM*s, usually start with a lower rate, but can end up costing more in the long run if rates rise. Calculates payments and break-even times using two scenarios.

6. Life Insurance Needs (lines 7000–7999). Financial Planner takes into account a number of factors (see below) and suggests a policy (term, universal, or whole) based on your age, income, and savings.

7. Refinancing Your Mortgage (lines 8000–8999). Many houses were purchased when mortgage rates were 12 or 13 percent. This routine checks to see whether interest rates have come down far enough to refinance. It calculates the cost and break-even time (how long you must keep your house) before it makes sense (is profitable) to refinance.

8. IRA Planning (lines 9000–9999). Financial Planner compares a savings program in an IRA to a nonsheltered savings account. It helps you decide, on this basis, whether to contribute to your IRA this year. For most people, the answer is a definitive *Yes*, but what if you need the

William Chin

money to buy a house or pay for tuition in five years? This routine calculates how long it takes before early withdrawals (considered along with the penalty and taxes) are feasible.

Some General Considerations

Run the program and select one of the eight options. (Remember, any option you've omitted won't function.) A screen will appear with a list of variables and their default values. To change the value of a particular variable, move from one input field to another using the cursor-up and cursor-down keys. The current input field is shown in inverse. When you've reached the variable you wish to change, enter a new number and press RETURN. If you need to clear an input field, press the space bar or the CLR/HOME key.

Each module works in a similar manner; enter your values or use the defaults, and then press f1 to perform the calculation. After the result is displayed, press f1 to enter another set of values, f3 to print the screen, or ← (back arrow) to return to the main menu. Press ← from the menu to exit the program.

As noted, Financial Planner comes with a built-in calculator. To access it from the main menu or from within a module, press C. Then type in a formula, such as 4000*.075 (4000 times .075). To edit your entry, use the DEL key. (Note that the cursor keys do not function in this mode.) When you've entered your formula, press RETURN to execute the calculation and display the result. Then press C or ← to exit the calculator. (You can also exit the calculator by pressing =; this causes the current equation and result to be displayed at the top of the screen.)

Interest and inflation rates fluctuate; there is no way to know what future rates will be. The default rates used in the program are up-to-date as of this writing (March 1989). *USA Today* and *Money Magazine* publish current interest and inflation rates. To find out what rates of interest banks are charging, look in the business section of your local newspaper.

The annual rate of inflation is a factor in several modules. Typically, the Consumer Price Index (CPI) is used to measure the overall rate of inflation. For each of the past two years, the Consumer Price Index has risen by 4.4 percent. However, certain prices—such as those for college tuition—have been rising faster. You may wish to take this into consideration with option 1 (College Planning).

Since Financial Planner uses BASIC 2.0 math routines in its calculations, results may sometimes be off by a few cents. For this reason, program input is limited to whole dollar amounts.

Although Financial Planner has endured extensive testing, we don't recommend you make any final decisions based on this program alone. Instead, use the results it provides as a guide.

Let's now discuss the individual input variables used in each module and how to interpret the program's output.

College Planning

Today's annual cost. According to the *Wall Street Journal*, annual expenses for private colleges are about $11,500 a year; this includes room, board, tuition, and books. State colleges cost about $4,500 a year for an in-state student. However, if you're considering an Ivy League school, current costs are about $17,500 a year.

Inflation rate. The inflation rate for college costs has run about 7 percent over the last two years. But inflation has a way of leveling out, so the default rate of 4.4 percent is not unrealistic.

Years until college. Many children enter college at the age of 18. Thus, if your child is 7 years old, enter 11 on this line.

 # years in college. Typical choices are 4, 2, or 6.

Present savings. This is how much you've saved specifically for college; don't include money saved for other things.

After tax yield. This is the rate of interest your money's earning after taxes. Interest rates are impossible to predict, so we use a current rate. The default rate of 7.35 percent is the yield that U.S. Savings Bonds are currently paying.

Beginning in 1990, interest on newly purchased savings bonds will be tax-exempt if the redeemed bonds are used to pay for tuition and your income is less than $90,000 a year. Savings bonds are available at major banks and can be purchased in $25 units. If you do use savings bonds, count the cost of the bond, not its face value (a $100 bond costs you $50) toward the amount you need to save each year.

If you do not go the savings bond route, use Financial Planner's built-in calculator to figure out the after-tax yield. For example, you've put the money into 5-year CDs (certificates of deposit) yielding 9 percent and you're in the 28-percent tax bracket. Press C to activate the calculator. Now, enter 1−28/100. The calculator displays .72 as the result. Continue by entering *9 to multiply by 9. You'll see that the after-tax yield is 6.48. Press = to exit the calculator; then type in the value.

Output. Recommends how much to save each year to meet your goal. Several colleges are offering prepayment plans, where you deposit money with them today to pay for tuition when your child reaches college age. See how the results from Financial Planner compare with these plans.

Car Buy/Lease

Buying a car usually requires more up-front money and higher monthly payments, but is cheaper in the long run than leasing. Leasing requires a big payment at termination to buy the car. If you don't have money for a down payment or can't afford a higher monthly payment, leasing may be the way to go. And Financial Planner tells you just how much leasing that dream car will cost you.

When you purchase a car, many promotions give the choice of a cash rebate or a lower finance rate. By changing the finance terms and ignoring the lease portion of this module, you can compare the real costs of each.

Inflation rate. Again, the default rate is 4.4 percent (see previous option).

BUY

Price of car. Cash price for the car you want to buy.

Financing. Can be *Yes* or *No*. If you select *No*, the next three lines are ignored so that the total and real costs are simply the price paid.

Trade-in/down payment. How much the dealer gives you for your old car and/or the amount of cash

you put down.

Annual % rate. Auto loans from banks on new cars run about 12 percent. Rates on used cars are often higher; 13.9 percent or even 16 percent is not uncommon. Car dealers often offer special promotions with lower rates or a cash rebate.

# of monthly payments. How much time it will take you to pay off the loan. Loans on new cars usually run 48 or 60 months. Loans on used cars are typically 30 or 36 months.

LEASE

Refundable security deposit. This is returned to you at the expiration of the lease, but all that time erodes the value of your money.

Initial payment. The amount you pay before you get the keys, which is not refunded. Many leases call for first and last payments to be made at the beginning of the lease. If this is the case, include the last payment here and subtract one month from the length of the lease (# of payments, below).

Monthly payment. What you pay each month, rounded off to the nearest dollar.

# of payments. Leases usually run 48 or 60 months. Remember to subtract 1 if the last payment is made at the start of the lease.

Buy out price. At the end of the lease, you have the option to buy the car. To make the comparison with owning a car valid, Financial Planner assumes you buy the leased car.

Output. The total of all costs for buying and leasing are displayed along with the totals adjusted for inflation. The monthly payment for financing is also shown.

Compound Interest/Savings

This module is a little different. It calculates any one of five variables when you provide the other four. Be sure you move the cursor to the value you want to calculate.

Present value. The amount that's presently in your account.

Monthly addition. How much you plan to deposit each month.

Annual yield. The default rate is what banks currently pay on money market accounts. This rate changes often; it was below 6 percent a year ago.

# of years. How long you plan to make the monthly addition.

Future value. Your account balance after all deposits have been made.

Output. Reported in terms of one of the five variables.

Loan Payments

Much like the previous module, this one calculates any one of four variables when you provide the other three. Renters can see how much mortgage they can afford based on their rent. For example, to do this for a 30-year mortgage, enter monthly rent as the *Monthly payment*, 360 for *# of monthly payments*, and the current mortgage rate for *Interest rate*. Then move the cursor up to *Amount of loan* and press f1.

To print out a loan payment schedule, press f5 and enter the starting date for the loan. This printout gives you the outstanding balance of the loan for any date. It also shows how much of each payment goes toward principal and how much is for interest.

Amount of loan. How much do you want to borrow?

Interest rate. Prevailing rates on home equity loans are about 11.5 percent; rates for unsecured personal loans are closer to 18 percent.

# of monthly payments. How long before you pay off the loan?

Monthly payment. Amount of each payment. This is what most people want to calculate.

Output. Reported in terms of one of the four variables.

Fixed/Adjustable Rate Mortgage

For most of us, this can be a very complex and confusing subject. Fixed rate mortgages have been around for many years and are the most popular. Adjustable rate mortgages (ARMs) are relatively new. Their rate of interest is tied to a benchmark rate like the prime or the five-year Treasury bill rate. If interest rates go up or down, so do your payments.

In general, ARMs are good when you sell quickly or interest rates go down. ARMs usually start with a lower interest rate, but can end up costing much more than a comparable fixed rate mortgage if interest rates go up. Some ARMs have an artificially low rate the first year. If you are considering an ARM, take a good look at the worst-case scenario. If the payments make you shudder, you may want to stick with a fixed rate mortgage.

Principal. This is the amount you want to borrow. The average price of a house nationwide is $115,000.

Points. A percentage of the principal, paid when you initiate the mortgage.

FIXED RATE MORTGAGE

Annual % rate. Rates today are about 10.86 percent for a 30-year mortgage and 10.68 percent on a 15-year mortgage.

# of years. Thirty-year mortgages are very popular, as are those with 15-year terms.

ADJUSTABLE RATE MORTGAGE

Initial interest rate. The rate for the first year of the mortgage.

Yearly cap. The maximum amount the interest rate can increase in one year; most ARMs have a 2-percent yearly cap.

Lifetime cap. The highest the rate can be over the life of the mortgage. Fourteen percent is the most common cap.

# of years. For the sake of comparison, this should be the same as the length of time for the fixed rate mortgage.

Output. After you've read the results, press f5 for more analysis. The initial results include monthly payments for each type of mortgage. Financial Planner does not handle biweekly payments or other alternative payment schedules.

Two different scenarios are used to figure out future payments on the ARM. The first has interest rates rising 0.5 percent a year. The second is the worst-case scenario, with rates going up the maximum each year until the lifetime cap is reached. ARMs were good to have over the last three years, as interest rates remained low. With the possibility of higher rates, consider the worst-case scenario.

Further analysis displays the break-even times for the ARM in

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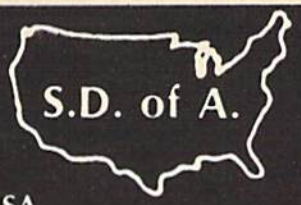

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each scenario. This tells you how soon you must sell for the adjustable rate mortgage to make sense. Finally, press f5 again to print the **cost analysis table**. This printout tells you the inflation-adjusted cost for each mortgage and what the monthly payment on the ARM might be in the future.

Life Insurance Needs

Ask five different financial planners and you may end up with five different answers. So use this program only as a rough guide when considering your life insurance.

The program bases your life insurance needs on the following:

1. Final expenses, such as the funeral. This figure doesn't include probate costs, estate taxes, or medical expenses due to a lengthy illness.

2. Paying debts, based on your percentage of total household income. Debts are not paid up unless you are the sole source of income.

3. Replacing your income, based on income and number of dependents. This amount figures in Social Security survivors' benefits if you have children.

4. Sending children to college and any gifts to charities.

Financial Planner determines your current assets and then subtracts the sum of the four items above.

Total household salary income. Add up all salaries before taxes. Exclude any money earned from interest, dividends, or rental property.

Your salary, before taxes. If you are single, then this is the same as the above amount.

Annual savings. The total amount the household saves each year. Include everything: retirement savings, college funds, and vacation money. This is used to figure out how much income needs to be replaced.

Your age. This is used in deciding what type of life insurance policy you should have.

# of people in household. Include yourself in this count. As a general rule, the more people there are, the more insurance is needed.

Age of youngest person. This factors in when you're figuring out replacement income. Young children need income supplements for a long time.

Next, total the assets of all household members. Estimates are fine. Include your personal IRA account, but exclude your spouse's.

Cash, savings/checking accounts. Add up the balances from all household bank accounts. Include CDs, savings bonds, and Treasury securities.

Stocks, mutual funds. Include the value of stock held by any household member as well as the value of *your* retirement funds. Don't include retirement funds held by other members of your household.

Hard asset investments. Include tangible assets like a coin or stamp collection, antiques, or rental property. Exclude your primary residence and cars (unless they are collectibles).

Next, total the debts for everyone in the household. As with assets, estimates will suffice. If you and your spouse share responsibility for paying the monthly bills and one of you dies, the survivor can still pay some of the bills. The program uses a weighted percentage in this calculation. If you bring in 50 percent of the total household income, then 70 percent of the debts are to be repaid by your life insurance if you're in a 28-percent tax bracket.

Home mortgage. Enter the balance that you owe (check your annual statement). If your family doesn't own a house but plans to buy in the next year, then enter the amount you plan to borrow. If you have a life insurance policy as part of your mortgage, enter 0 here.

Car loan. Total up all outstanding balances. Again, estimates are fine.

Consumer debt. Balances due on credit cards and personal loans.

College fund. If you have no children, enter 0. Otherwise, use module 1 (College Planning) to calculate the amounts needed for each child, add them up, and then place the total here.

Charitable contributions. This is the place for donations to your favorite charities or relatives.

Current interest rate. The rate your estate can earn with no risk. Ten-year Treasury notes would be an ideal place to put the money to earn income; these are now yielding about 9.35 percent.

Output. A policy type and amount of insurance will be suggested. Life insurance can be very confusing. All types of life insurance have *premiums* and a *death benefit.* Premiums are what you pay in; the death benefit is how much your estate is paid when you die. *Universal* and *whole life* policies also have cash value. What follows is a short primer on the different types of policies.

Term insurance provides coverage for a specific time period. Your annual premiums stay constant during each policy term. With each renewal, premiums go up. This may not seem like a good deal, but remember, insurance needs are greatest when you have young children. A term policy may be participating (dividend-paying) or nonparticipating. Dividends on term policies tend to be small, so it doesn't make much difference if your policy pays a dividend. (It does matter a great deal for *whole life* policies.)

With term insurance you don't get any cash value; you are paying only for your insurance. If you live or work in Connecticut, New York, or Massachusetts, you can buy term life insurance from a savings bank at very low rates. Term insurance gives you the most coverage for the least amount of money and is recommended if you need a lot of coverage but don't have a lot of income or if you are a disciplined saver and have moderate insurance needs.

Universal life insurance is the most versatile type of policy. There are three elements to universal life: premium, cash value, and death benefit.

The annual premium is what you pay in. The company makes deductions for expenses and the cost of your insurance. What is left over is your cash value, which earns tax-deferred interest. Money in the cash-value account can be withdrawn or used as loan collateral.

Universal life policies come in two varieties. Under *Option A,* your survivors receive the face amount of the policy; with *Option B,* your survivors get this amount plus the accumulated cash value. You pay more for Option B and in effect get a little more insurance.

Buying universal life is almost like buying term insurance and in-

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vesting the added premium with the insurance company. This can be a very good investment because it grows at a tax-deferred rate.

Whole life also has the three elements: premium, cash value, and death benefit. Typically, whole life insurance premiums do not rise. This may seem good, but it really isn't, because the premium starts out high. Some companies offer *graded premium* or *modified premium* whole life insurance policies that have lower premiums in the first few years. But these modified plans don't really eliminate the disadvantages of whole life.

With whole life policies in general, the cash value accrues with time, and you can borrow against it or cash it out. The death benefit is paid to your survivors when you die. It is not easy to decrease the amount of your policy. This is a major drawback because your insurance needs are greatest after you have started a family, and they decrease as your children leave home. Whole life is recommended for people who have large incomes and little or no savings, since it's a good method of forced saving.

New on the scene are *variable life* insurance policies. They offer consumers a chance to invest in the stock or bond market by putting their investments in a life insurance contract. Financial Planner is not programmed to recommend this type of insurance because your costs and cash-value appreciation depend on how well the stock or bond market does.

When it comes to life insurance, the standard line is to get term insurance and invest the difference that you would normally pay in as premiums. The tax-deferred appreciation offered in a universal life policy is an attractive way to save money as well. Whole life lacks flexibility and most families can't afford the coverage they need.

Refinancing a Mortgage

Back in 1982, when the prime rate reached 20 percent, mortgage rates reached all-time highs of 15 percent. Now that interest rates have fallen, it may be time to refinance your mortgage.

CURRENT FINANCING

Current balance. The amount you owe on the existing mortgage. You can usually find this on the annual mortgage statement. You may also use option 4 (the Loan Payments module) to print out a schedule and take the balance from there.

Annual % rate. This module handles fixed rate mortgages only; it's not designed for adjustable rate mortgages.

# of payments due. How many payments are left to make?

SUGGESTED REFINANCING

Principal. Usually the same as the current balance on the existing mortgage. The new principal may be larger, especially if money is needed for tuition or a new car.

Annual % rate. Interest rate on the new mortgage.

# of payments. Term of the new mortgage.

Points. A percentage of the principal paid when you take out the mortgage.

Other closing costs. Although you've already had a title search, the mortgage company requires another one.

Prepayment penalty. Many mortgages now have penalties for early payments. This is to make mortgage-backed securities more attractive.

Tax bracket. Include state income taxes in the total percent.

Interest and points deductible. A *Yes* or *No* choice. Points are deducted over the life of the mortgage in our analysis. This is a conservative calculation, because many taxpayers can deduct the points immediately.

Inflation rate. Use the value of the Consumer Price Index (CPI) here.

Output. Displays the difference between the old payments and the new payments. If refinancing is profitable, Financial Planner tells you how long it will be before you reach the break-even point. Otherwise, the program tells you that refinancing costs you money. You should keep your current mortgage if you plan to sell before the break-even time or if refinancing costs you money. If either of these conditions is met and you need money for other expenses, consider a home equity loan or a second mortgage. A rule of thumb is that the interest rate on the new mortgage should be at least two percentage points below the rate on the current mortgage for refinancing to be considered.

IRA Planning

Your age. Used in figuring an early withdrawal penalty and the IRA's future value.

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Output. Financial Planner calculates how much this year's contribution will be worth upon retirement, inside or outside an IRA. It also figures out how much your entire account will be worth if you contribute the same amount each year and what that will be worth after inflation. Finally, the break-even time for early withdrawals is given. This last piece of information is very useful should you need this money before retirement.

See program listing on page 84. **G**

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1581 Directory Sorter

Robert Czeisel

This enhanced version of "1581 Alphabetizer" (February 1989) allows you to sort your 1581 directories in alphabetical or reverse alphabetical order. It also offers an editor that allows you to place files in any order. For the 64 and 128.

One 1581 disk can hold almost 300 files. Being able to store large amounts of data on each disk can be quite a boon. It can also make finding a particular file very difficult. By allowing you to place your files in any order, "1581 Directory Sorter" makes them easier to find.

1581 Directory Sorter can sort your directory entries in alphabetical and reverse alphabetical order. You can also choose to read the files in their original order and then rearrange them yourself. Once in memory, you can view up to 96 files on the screen at a time and you can move files from place to place with only a few keypresses.

Directory Sorter has the unique ability to detect whether it's running on a 64 or 128 and whether the 128 is in 40- or 80-column mode. In 128 mode, the program uses fast mode whenever possible.

Typing It In

1581 Directory Sorter is written in BASIC and may be entered on either the 64 or the 128. If you intend to use the program on the 128, you should enter it in 128 mode to ensure that all the lines are tokenized correctly. 1581 Directory Sorter writes directly to disk when run, so it's important that you type in the program carefully. The first time you test the program, run it on an unimportant disk.

To get started, load and run 1581 Directory Sorter. First, the program prompts you for the drive number. Enter the device number of your 1581 or press RETURN to accept 8 as the default drive number. Next, Directory Sorter checks the disk drive to see whether it is a 1581. This step is important because if you were to treat a disk formatted on a 1571 as if it were a 3½-inch disk, important data could be lost. If the drive you've selected isn't a 1581, the program warns you and requests a new device number. You can enter 0 at this prompt to exit the program.

Once the program is satisfied that the selected drive is a 1581, it asks for the type of sort you'd like it to perform as it reads the directory from the disk. Press A to sort the directory in alphabetical order *(A–Z)*, press Z to sort it in reverse alphabetical order *(Z–A)*, or press M to read the directory entries without changing their order. Each time it reads a directory entry, Directory Sorter prints a dot on the screen. The program enters edit mode when all entries have been read.

Rearranging

In edit mode, 1581 Directory Sorter shows as many as 96 files on the screen at a time with a 128 and an 80-column monitor. If you're using a 64 or a 128 in 40-column mode, Directory Sorter displays 48 files at a time. If the disk contains more than one screenful of files, press + to step forward through the files one screen at a time. Press − to step backward through the files.

At the top of the screen, you'll see the white edit cursor. You can move the cursor with the up-, down-, left- and right-cursor keys. Move it to the top of the current column by pressing ↑. Press SHIFT-↑ to move to the bottom of the current column. Press CLR/HOME to move to the first file on the screen.

To move one or more files to a new position, move the edit cursor to the first file and press G (group). The white edit cursor changes to red to let you know you're in group mode. Press the cursor-down key until the last file you wish to move is highlighted. If you move the cursor past the last filename, the program displays the next screen.

Once you've selected the files you want to move, press G again. The files you select are removed from the list and the files below them are moved up to fill in the empty space. The edit cursor now changes color again. Move the edit cursor to the location you want the files moved to. If the cursor is in front of the former location of the files, it becomes green. If it's after the old location, it turns gray. Select the location for the files and press G. The file under the cursor and the ones below it are moved down; the files that you picked up are placed into the vacated space, and the edit cursor turns white again.

While you're in group mode (the edit cursor is green or gray), you can look at the files you've picked up by pressing F. Directory Sorter displays the old directory location and the name of each of the files you've picked up. Press RETURN to look at more of the files or E to return to the edit screen. If you change your mind about moving the files, cancel by pressing C.

You may rearrange files in any order you wish. When you're satisfied with the order, press Q to exit edit mode. Note that you cannot exit edit mode if you've picked up files without putting them down.

Save It?

Once the directory is in order, 1581 Directory Sorter asks whether you would like to save the new directory. Up until this point, everything you've done has been carried out in memory. If you want to leave the disk directory unchanged, press N. Press Y to write the new directory and validate the disk.

See program listing on page 83. **G**

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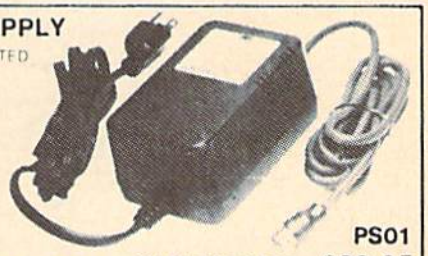

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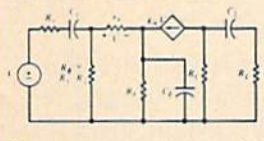

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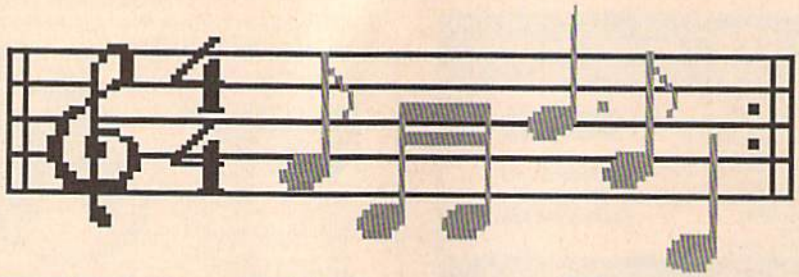


SFX Machine

Larry Cotton

Discover the fantastic potential of the SID chip with this unusual yet powerful sound-effects generator. Disk drive required.

The Commodore 64, with its dedicated Sound Interface Device (SID) chip, has long been known for its superior sound capabilities. But for most, producing sophisticated sound effects on the 64 is difficult at best.

With the introduction of "SFX Machine," a simple sound-effects generator, this is no longer the case. Not only does it make sounds; SFX Machine *makes them up*. And best of all, it only takes a single keypress to hear each one.

Getting Started

Except for one short machine language routine, SFX Machine is written entirely in BASIC. Type it in using "The Automatic Proofreader," found near the back of this issue. Be sure to save a copy of the program to disk.

To use SFX Machine, just load and run it. After a brief pause, the menu screen appears. To hear a sound effect, turn up the volume on your TV set or monitor and press the space bar. (The effect can be greatly enhanced by connecting the 64's audio output to a good amplifier.)

Don't like the sound? Press the RETURN key to generate another. Since all the sounds are randomly generated, some will be more impressive than others.

Saving and Loading Sounds

Once you hear a sound you like, you can save it to disk or store it in memory by assigning it to one of the number keys. To save a sound, press S; then press K for keyboard or D for disk.

If you press K, the program assigns the sound to the number keys (1–9) in sequential order and then returns you to the main menu screen. The status bar (shown in inverse) on the right side of the screen tells you which keys have sounds. The status bar on the left tells you which sound you're currently hearing. To review any numbered sound, press the appropriate number key, then the space bar. Once you've assigned sounds to all the number keys, the next save you make automatically goes to disk.

If you choose to save sounds to disk, the program requests a filename for the sound effect. Enter a filename that is 16 characters or less in length. Enter $ to look at a directory of the disk. Be careful when using the disk, since SFX lacks error checking.

To reload a sound from disk, press L from the main menu. As with saving sound effects, the program requests a filename. Enter the name of the file you want to load or $ to view the disk directory.

Pitch Control

SFX Machine allows you to adjust the pitch of any sound. To raise or lower the pitch of a sound, press + or −, respectively. Note that some sounds don't change much when you alter the pitch.

Pitch is always saved as part of the sound. Simple tunes can be composed with one sound effect by changing the sound's pitch and assigning it to several different keys.

To repeat a single sound indefinitely, press R (you can also hold down the space bar). As you'll discover, some sounds take on unpredictable characteristics when played continuously. To stop a continuous sound, press any key.

Where the Sounds Are

The Commodore 64 can play up to three voices simultaneously. The basis for most of the sounds created by SFX Machine sounds is that voices 1 and 2 play together, at times slightly detuned and/or modulated by voice 3. Complex waveforms are created by combining the normal ones—triangle, sawtooth, square, and noise—while adding ring modulation, synchronization, or a combination of these.

Since all the sounds are randomly created, the results are unpredictable and often better than those deliberately created.

See program listing on page 71. **G**

THE programmer's page

64 Tips and 1571 ROMs

Randy Thompson

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

I recently received a letter asking for a 64 version of a tip published in the May 1989 "Programmer's Page." In this tip, Anderson N. Cadell explained how you can make your BASIC 128 programs automatically run when loaded. With 128 and 64 memory maps at my side, I came up with a solution.

• Add the following line to the beginning of your program:

```
0 POKE 43,1:POKE 44,8:POKE
  770,131:POKE 771,164
```

• With your program in memory, enter these commands and press RETURN:

```
PRINT"{CLR}":POKE43,3:POKE44,3
  :POKE770,113:POKE771,168:POKE
  157,0:SAVE"filename",8
```

• When READY flashes at the top of the screen, turn your computer off and then on again. Now, entering the command **LOAD *"filename"*,8,1** will cause your program to load and run automatically. If you wish to have the RUN/STOP–RESTORE key combination disabled as well, remove the last two POKEs in line 0.

Unwanted Lines

If you don't own a utility that allows you to erase a range of BASIC lines, Helen Roth of Los Angeles, California, has an easy solution.

Load the program that contains the lines you wish to delete and enter the command POKE 774,0. Now, LIST the lines you want to remove. For example, to delete lines 250–300, enter LIST 250–300. The line numbers will list to the screen, but the lines' text will not. Position the cursor on the first line number and continue to press RETURN until you've run the cursor over all the lines you want to get rid of. (This method works best when you're deleting 23 or fewer lines, since additional line numbers will scroll off the screen.) Enter POKE 774,26:LIST to view your program—less the deleted lines, of course.

64 UnNEW

This next tip was sent in by Robert Crisafio of Queens Park, West Australia. To resurrect a BASIC program after you've typed NEW or reset the computer, enter the following two commands:

```
POKE 2050,8
SYS 42291
```

Now be sure to save your program so you won't have to use this tip again.

1571 Update

Queries and information about the 1571 and its ROMs just keep pouring in. There seems to be a lot of misinformation floating around out there, and my mistakes in previous "Programmer's Page" columns haven't helped any, either. With the aid of some Commodore technicians, knowledgeable user groups, and many of you, I think we can finally clear this whole thing up.

According to Mark E. Odell, a technician at an authorized Commodore service center, there are only three versions of ROM for the 1571. These chips are numbered 310654-01, 310654-03, and 310654-05, with 310654-05 being the latest revision. The ROM chip that bears these numbers is hidden under the disk drive's power supply, near the back of the unit.

The most accurate method of determining which ROM you have is to open up your disk drive and look. Realizing that this isn't the most desirable method, Mr. Odell and reader W. Anthony Marsh sent in programs that PEEK the drive's ROM to check which version you have. Mr. Odell's program, listed as Program 1, is 1571-specific. Program 2, supplied by Mr. Marsh, is in the public domain. Written by F. Bowen, Program 2 detects the ROMs for 1541s and 1581s as well as those for 1571s.

To use either program, simply type it in, save it to disk, and then run it. In the case of Program 1, a DOS ROM revision of -01 or -03 signifies that your 1571 has the old ROMs (-05 is the latest upgrade). Program 2 asks which unit you wish to test (8–11) and then tells you which type of drive you have—1541, 1571, or 1581—and whether or not you need an upgrade. A 1571cr, by the way, is the 128D's internal drive. Mr. Odell says that he knows of two different 128D internal drive ROMs, numbered 318047-01 (old version) and 252372-01 (new version). At present, he doesn't know the differences between the ROMs or how to detect them via software.

We don't have every type of 1571 here at COMPUTE!, so we were unable to test Program 1 thoroughly. However, we can say that it works on all the 1571s that we do own. Program 2 seems fairly reliable, but it did fail to recognize two of our older Commodore drives.

As a point of interest, you might read *Gazette*'s June 1989 "Horizons" column. There's a rumor that the 1571 has reached retirement age and is about to be pulled from Commodore's production line. (It appears that Commodore won't be doing any more 1571 upgrades.) "Horizons" columnist Rhett Anderson has an interesting discussion on this and another seemingly ill-fated Commodore product. Read it and see what you think.

See program listings on page 76. **G**

BASIC for beginners

Musical POKEs

Larry Cotton

It's not often, in this column, that we've focused on just one computer. Our discussions usually encompass the 128, 64, Plus/4, and 16. However, for the next couple of months, I'd like to concentrate on two important BASIC keywords, *POKE* and *PEEK*, on my favorite machine, the Commodore 64.

POKE (a statement) and PEEK (an integer function) are an integral part of most BASICs. These keywords do nothing by themselves—but, when followed by the right numbers, they can be powerful tools for the BASIC programmer.

Some Rules of Usage

We've casually used POKE before on the 64:

```
10 POKE 53280,0:POKE 53281,0
   :POKE 646,1
```

This line changes the border and background colors of your screen to black and the cursor to white. The number immediately following the POKE statement is a memory location in the computer; the number after the comma is a value that is stuffed into that location.

POKE is used to change the contents of the computer's internal memory—known as *RAM*, or *random access memory*. When you first switch on a computer, each memory location contains a certain value (called a *default* value), some of which are preprogrammed at the factory. Most memory locations can be altered with the POKE statement.

PEEK, in a sense, is the opposite of POKE; it's used to examine the contents of the computer's internal memory. As we'll see in the coming months, the values you PEEK can, in turn, be POKEd elsewhere.

Certain memory locations, such as those which control the computer's sound-generating voices, can only be POKEd, or written to. Others—also in the sound area—can only be PEEKed, or read. The contents of any memory location can range from 0 to 255. If you attempt to POKE a value outside this range into memory, you'll get an ILLEGAL QUANTITY ERROR message.

A SID Experience

Since the memory locations in the SID chip—the part of the computer which creates sound—can be POKEd or PEEKed, it seems like a good place to experiment. The SID chip's memory locations (also called *control registers*) are located at locations 54272 through 54300. Locations 54272–54296 can only be POKEd; locations 54297–54300 can only be PEEKed.

Let's begin our experiment by clearing the screen. Hold down SHIFT and press the CLR/HOME key. The cursor should be in the home position—the extreme upper left corner of the screen.

Next, clear the SID chip's memory by setting its first 25 "POKEable" control registers to 0. We'll do that with a simple FOR-NEXT loop:

```
FOR J=54272 TO 54296:POKE J,0:NEXT
```

(As you type in these lines, be sure to press RETURN at the end of each line. You're in immediate mode—no program line numbers—so the computer will respond immediately after you've pressed RETURN. Also, leave these lines on the screen because we'll change them later. *Don't clear the screen.*)

The next line sets the volume (loudness) control register to maximum:

```
POKE 54296,15
```

The volume level can range from 0 to 15. (Values above 15 affect things other than loudness.)

When you press RETURN on this line, it executes and the loudness level is set. You won't hear much yet because you haven't set any of the other parameters required to play a note. If your monitor's volume has been turned up, you may have heard a small click or pop as the SID chip's volume control register jumped from off (0) to full volume (15).

Here's the Pitch

Now we'll set the *pitch*. (An example of pitch: A siren's sound alternately rises and falls in pitch while maintaining a relatively constant loudness.) Any value from 0 to 255 can be POKEd there; the higher the number, the higher the pitch. A value of 30 produces a pleasant pitch. Enter this:

```
POKE 54273,30
```

Location 54273 is just one of the six registers which control the SID chip's pitch. The Commodore 64 is blessed with three separate voices; the pitch and other characteristics of each voice can be controlled independently. We'll work only with voice 1. Location 54273 controls the "coarse" pitch of voice 1.

Now enter this line, which I'll explain later:

```
POKE 54275,8
```

The ADSR Envelope

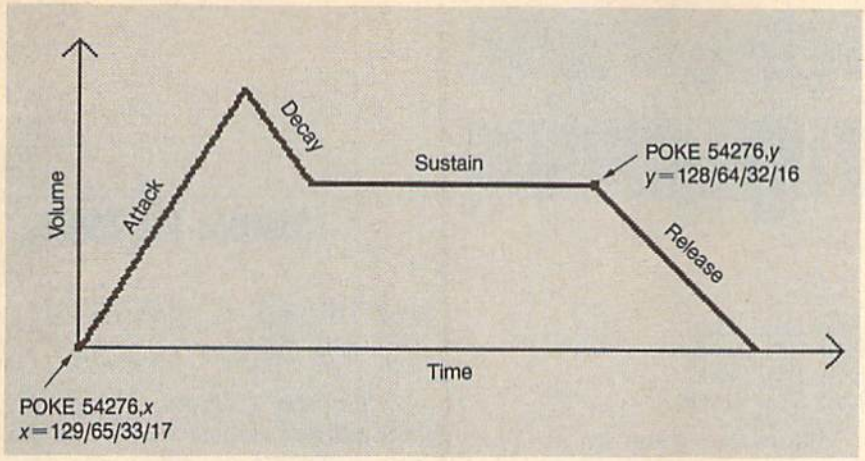
We'll next work with two tricky registers called the *envelope* control registers. The envelope of a sound is its loudness plotted against time. It runs from the first instant you hear the sound until it dies out (see Figure 1). The envelope is divided into four parts—*attack*, *decay*, *sustain*, and *release* (sometimes abbreviated ADSR).

Enter this line, which sets attack and decay:

```
POKE 54277,12
```

The attack/decay value controls how fast the note will reach a particular loudness level and how fast the loudness will drop to the sustain level.

Figure 1. Sound Envelope



Now set the sustain and release:

```
POKE 54278,90
```

If you've been entering these lines, you're about to be rewarded with a sound. (Up to this point, we've only set parameters necessary for a sound to be heard.)

Gating the Sound

Type this line and press RETURN:

```
POKE 54276,33
```

You should hear a sound.

The sound you hear has been triggered (or gated) by POKEing a 33 in control register 54276, initiating the attack/decay/sustain cycle. You are listening to the sound's sustain-level loudness. It will stay at this level until you type the next line and press RETURN:

```
POKE 54276,32
```

This turns the note off. How fast the note dies out is called the *release* phase of the envelope. Sustain and release were set by POKEing 54278 with 90, above.

When you hear a song being played on the 64, the loudness and ADSR values are usually set only once at the beginning. All that's left to do is to control the pitch and the note durations.

Sound Affects

The memory registers you have POKEd will retain their values until you change them or turn the computer off. So let's change some.

Move the cursor up to POKE 54276,33 and press RETURN. You should hear the note sound again. While listening to it, move the cursor up to the line that reads POKE 54273,30, which sets the pitch. Position the cursor over the 3 in 30 and type another value between 0 and 255; then press RETURN. You are using POKE again to change the contents of memory register 54273, or the note's pitch. Try moving the cursor to other lines, POKEing various values into the control registers and observing the results.

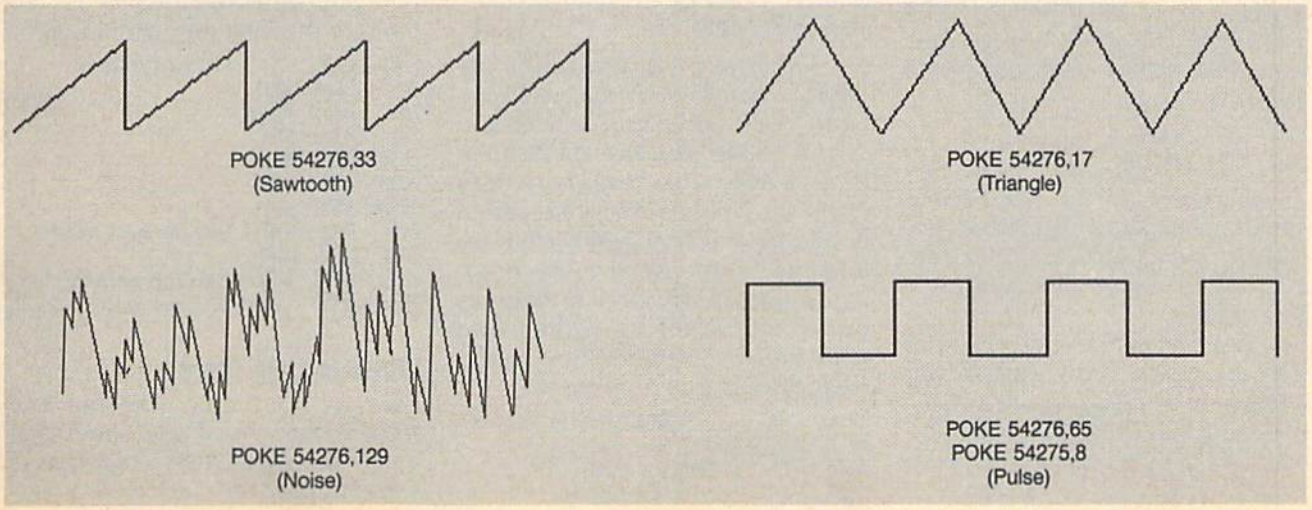
Register 54276 reacts only to some very specific values. (These values can be found in the *User's Guide* or the *Programmer's Reference Guide*.) This register not only turns the note on and off, but it also controls a voice's *waveform*, or how a note sounds. You've heard the sound of only one of the 64's four waveforms—the *sawtooth* wave. To hear the *triangle* waveform, POKE 17 into 54276 to turn it on and 16 to turn it off. Do the same for the *noise* waveform with 129 and 128 (see Figure 2).

There's one more waveform which the 64 possesses—the *pulse* wave. It's turned on by POKEing 65 to 54276. This voice would not be audible if we had not entered POKE 54275,8 above. That POKE sets the shape of the pulse wave to an audible value. Try POKEing various values into 54275. To hear the results of your experiments, always follow with POKE 54276,65 and POKE 54276,64.

Hear's a mind-boggler: Since the envelope control registers 54277 and 54278 can each be POKEd with values from 0 to 255, there are a possible 65,536 settings for a sound's envelope! The attack and sustain portions are incremented by 16 from 0 to 240; the decay and release portions are incremented by 1 from 0 to 15.

Next month, we'll see how we arrived at the values POKEd in 54277 and 54278, respectively, and how you can determine which values to POKE to achieve the ADSR you want to hear. **G**

Figure 2. Waveforms



machine language programming

Simple ML Music

Jim Butterfield

On the 64, whether you program in BASIC or in machine language, you make music the same way—with the SID chip. When it comes to programming sound, what gives machine language the edge is its inherent speed. Since ML is so fast, there's plenty of time for special effects such as *vibrato* (pulsating the frequency to add richness to the sound).

Before tackling any sophisticated techniques, though, you'll want to make sure you understand the basics. This month, we'll examine the simplest possible coding scheme for ML music—one voice, no special effects.

Two for One

The program that accompanies this column POKEs a machine language music player into memory. Also provided within the program (in REM statements) is the equivalent BASIC code. Music data for the first few lines of "Three Blind Mice" completes the listing. If you like, you can add to the code to finish the tune, or you can write your own music.

As in BASIC, our first task is to turn up the master volume control. BASIC does this with POKE 54296,15. In our ML program, which we locate at $2000 (8192 decimal), we use

```
2000  LDA  #$0F
2002  STA  $D418
```

If you're up on hexadecimal notation, you know that $0F is decimal 15, and address $D418 is decimal 54296. Same task, different language.

The next item is to set the *envelope:* the attack, decay, sustain, and release. In BASIC, we set voice 1 values by POKEing locations 54277 and 54278 with the appropriate values. In ML, we do the same:

```
2005  LDA  #$25
2007  STA  $D405
200A  LDA  #$0C
200C  STA  $D406
```

Note that when we use hexadecimal, we're able to read the various components directly from the hex value. Hexadecimal 25 for attack/decay means an attack of 2, a decay of 5. Once you get accustomed to it, you'll find hexadecimal much easier to use in this application than decimal.

Since our tune may be long—much longer than 256 bytes—we can't scan through the notes using simple index addressing. To get greater reach, we set up an indirect address, located in zero page at $FC and $FD, that points to our music at address $2800 (decimal 10240):

```
200F  LDA  #$28
2011  STA  $FD
2013  LDA  #$00
2015  STA  $FC
```

Good Timing

Each note is stored as three data values: a duration byte and two frequency bytes, low and high byte, respectively. Using the duration byte, we first check the note timing. If it's 0, it's time to turn off the volume and quit.

```
2017  LDY  #$00
2019  LDA  ($FC),Y
201B  BEQ  $205E
```

Otherwise, we calculate future times: when to start the note's release cycle (after four jiffies) and when to go get the next note (whenever the duration has elapsed). The two times are stored at addresses $2701 and $2700, respectively. We use the low-order byte of the TI jiffy clock (at $A2) as our timer. There's a coding fine point involved with this time check; we'll discuss it in a moment.

```
201D  CLC          (add delay to TI...)
201E  ADC  $A2
2020  STA  $2700  (...and store)
2023  CLC          (add 4 jiffies...)
2024  LDA  $A2     (...to TI...)
2026  ADC  #$04
2028  STA  $2701  (...and store)
```

Register Y serves as our indirect address extension. With it, we can reach into the three-byte data grouping to get the proper value. (The instruction at $2017 initializes Y to 0.) After fetching the note's duration, we dig out its frequency—first the low byte, then the high byte—and store these values in the appropriate SID chip registers.

```
202B  INY
202C  LDA  ($FC),Y
202E  STA  $D400
2031  INY
2032  LDA  ($FC),Y
2034  STA  $D401
```

Next, we start the attack/decay/sustain cycle for the note. In about four jiffies, we begin the release cycle so the note continues to sound for a while.

```
2037  LDA  #$11  (start note)
2039  STA  $D404
203C  LDA  $2701
203F  CMP  $A2
2041  BPL  $203F  (wait 4 jiffies)
2043  LDA  #$10
2045  STA  $D404  (start release cycle)
2048  LDA  $2700
204B  CMP  $A2
204D  BPL  $204B  (wait the duration)
```

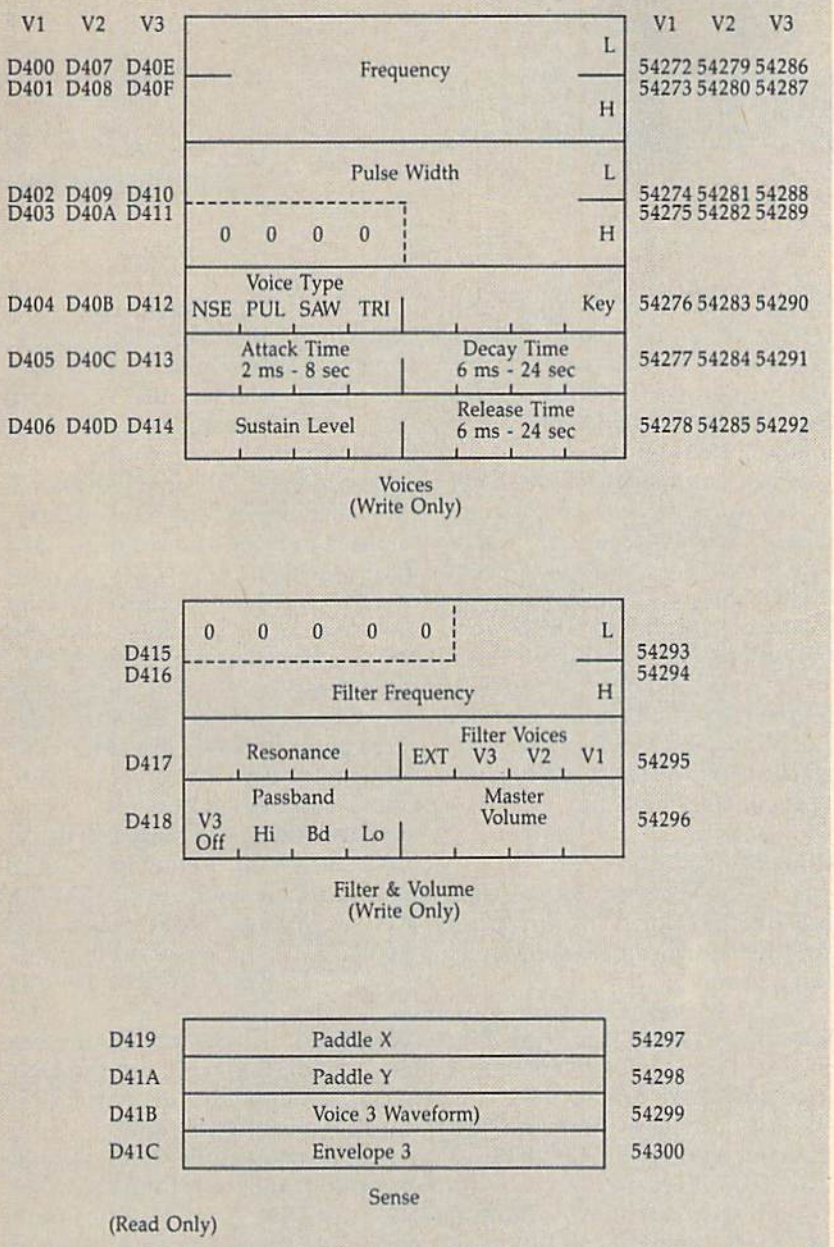
When the note's time is up, we go back for a new one and do it all again. In the process, we bump the note pointer along, three bytes at a time, to the next note grouping.

```
204F  CLC          (update pointer)
2050  LDA  $FC
2052  ADC  #$03
2054  STA  $FC
2056  LDA  $FD
2058  ADC  #$00
205A  STA  $FD
205C  BCC  $2017  (get the next note)
205E  LDA  #$00
2060  STA  $D418  (turn off volume...)
2063  RTS          (...and exit)
```

When Is Less More?

Now for the timing question. The jiffy timer could go "over the top"—that is, it could wrap around to 0. Suppose the clock were at val-

The 6581 Sid Chip



Special voice features (TEST, RING MOD, SYNC) are omitted from the above diagram.

ue 250 and we wanted to calculate ahead 20 jiffies. The total would be 14, not 270; that's too big for a single-byte number. Suddenly, our ideas of greater than and less than need revising.

It's like the puzzle: Is October before February? Answer: Yes and no. In practical terms, the answer is yes, since there are fewer months going from October to February than vice versa. But here we have to adjust our approach to testing for bigger and smaller.

Amazingly, there's a simple way to do this on the 6510. Do a comparison the usual way—using CMP, CPX, or CPY. After the comparison, the N flag tells us which way around the loop is shorter. When this flag is used, $A0 is greater than $60 (which you might expect), and $45 is greater than $FF (which you might NOT expect). For normal comparisons, the N flag is useless. But for this wraparound test, it's ideal. So we use it for each delay loop.

Because of the delay loops, most of the time the program just sits as the SID chip plays. These pauses, though, give you the opportunity to execute sound-enriching routines. Now that you've got the basics down, all you need to do is to write the code.

Three Blind Mice

```
PC 10 REM ML PROGRAM DATA
BG 20 DATA 169,15,141,24,212,1
      69,37,141,5,212,169,12,1
      41,6,212
AA 30 DATA 169,40,133,253,169,
      0,133,252,160,0,177,252,
      240,65
DP 40 DATA 24,101,162,141,0,39
      ,24,165,162,105,4,141,1,
      39
CH 50 DATA 200,177,252,141,0,2
      12,200,177,252,141,1,212
XJ 60 DATA 169,17,141,4,212,17
      3,1,39,197,162,16,252,16
      9,16,141,4,212
DE 70 DATA 173,0,39,197,162,16
      ,252,24,165,252,105,3,13
      3,252
JX 80 DATA 165,253,105,0,133,2
      53,144,185,169,0,141,24,
      212,96
DK 90 FORJ=8192TO8291:READX:T=
      T+X:POKEJ,X:NEXT:IFT<>12
      359THENSTOP
GK 100 REM MUSIC DATA (DURATIO
       N, LO-BYTE FREQ,HI-BYTE
       FREQ)
BS 110 DATA 30,31,21
XR 120 DATA 30,209,18
JS 130 DATA 60,195,16
EA 140 DATA 30,31,21
PX 150 DATA 30,209,18
FA 160 DATA 60,195,16
JG 170 DATA 30,30,25
SS 180 DATA 15,96,22
KB 190 DATA 15,96,22
DH 200 DATA 60,31,21
HK 210 DATA 30,30,25
SA 220 DATA 15,96,22
MD 230 DATA 15,96,22
XK 240 DATA 120,31,21
PF 250 DATA 0,0,0
BF 260 P=10240
CG 270 READ A,B,C
CK 280 POKE P,A:POKE P+1,B:POK
       E P+2,C
FG 290 P=P+3
AA 300 IF A<>0 THEN270
FF 310 SYS 8192
DB 320 REM HERE IS A BASIC EQU
       IVALENT
KR 330 REM ...TO THE M/L PROGR
       AM
HA 340 REM POKE 54296,15
AE 350 REM POKE 54277,32+ 5
PD 360 REM POKE 54278,12
DG 370 REM{4 SPACES}MUSIC LOOP
       S HERE
RP 380 REM READ T,L,H
XD 390 REM IF T=0 GOTO 1170
PM 400 REM TX=TI
PB 410 REM TA=TX+T
GJ 420 REM POKE 54272,L:POKE 5
       4273,H
JP 430 REM POKE 54276,17
RS 440 REM IF TI<TX+5 GOTO 112
       0
SP 450 REM POKE 54276,16
RG 460 REM IF TI<TA GOTO 1140
JP 470 REM GOTO 1060
XH 480 REM{4 SPACES}MUSIC QUIT
       S HERE
AC 490 REM POKE 54296,0
```

THE geos column

File Retriever

John F. Howard

Recover all the files you thought were deleted from your GEOS disks. Works with any Commodore drive, including 1541s, 1571s, 1581s, and RAM expanders. Runs under GEOS or GEOS128, versions 1.3 and higher.

In the December 1987 issue of *COMPUTE!'s Gazette*, we published "Trash Restorer," a utility which allows you to recover a file that has been thrown into GEOS's trash basket. Since that time, GEOS has gone through several upgrades; "File Retriever" brings Trash Restorer up to date.

File Retriever lets you recover GEOS and standard Commodore files that have been removed from the disk either by being scratched (Commodore files) or by being thrown into the trash basket (GEOS files). It works with all three Commodore drive types: 1541, 1571, and 1581. It also works with the 1750 and 1764 RAM Expansion Units (REU) that are used as RAM drives. File Retriever is more powerful than GEOS 2.0's UNDO DELETE function because it can restore every deleted file on the disk—not just the last file deleted. However, File Retriever can't retrieve files from a disk that has been erased using GEOS 2.0's disk-erase command.

Typing It In

Program 1, File Retriever, is written in machine language. Type it in using "MLX," the machine language entry program found elsewhere in this issue. When MLX prompts you, respond with the values given below.

Starting address: $1503
Ending address: $1EB2

Once you've entered the data for program 1, be sure to save it on a GEOS work disk with the filename FILERET. We'll use Program 2, "GeoConverter," to convert it to GEOS format. Save a second copy with the name FILERETRIEVER. This copy is a backup to use if something goes wrong.

If you don't already have GeoConverter on disk, type in program 2. Use "The Automatic Proofreader" to prevent typing mistakes when you enter this program. Save a copy of GeoConverter to the GEOS work disk that contains Program 1.

Now, run Program 2. You'll be prompted for a filename. Enter the name FILERET. GeoConverter converts the machine language file into an executable GEOS file.

Using the Program

To use File Retriever, double-click the FILERET icon. The program clears the screen and displays the startup screen.

File Retriever has two menus: File and Retrieve. From the File menu, you can display the information box or return to the deskTop. The Retrieve menu has an option for retrieving GEOS files and non-GEOS files.

To begin retrieving deleted files, select the type of files you want to search for from the Retrieve menu. File Retriever displays a dialog box and asks if you want to retrieve files from the currently active disk drive. The dialog box contains the name of the disk (or the RAM drive name) and several icons. The number and type of drives installed on your system determine which icons are displayed.

If you click the DISK icon, the computer prompts you to insert another disk into the active drive. This icon will not appear if the currently open drive is a RAM drive. The DRIVE icon allows you to toggle between drive A and B on a two-drive system. This icon will not appear if you have only one drive attached to your system. The CANCEL icon returns you to the opening screen without searching for files.

When you click the YES icon, File Retriever searches for files on the disk you have selected. If it finds a deleted file that can be retrieved, it displays a dialog box containing the name of the file and asks if you want to retrieve it. Click on the YES button to retrieve the file and continue searching. Click on NO to leave the file as is and continue searching. If you're retrieving non-GEOS files, File Retriever displays another dialog box asking for the Commodore file type of the file you're retrieving. The four Commodore file types supported are program (PRG), sequential (SEQ), relative (REL), and user (USR). The 1581 drive recognizes a fifth file type (CBM) which is used to partition a disk. GEOS doesn't use this file type and File Retriever doesn't recognize it. If you accidentally delete a file of this type, use the UNSCRATCH program that comes on the 1581 Test/Demo disk.

The vast majority of files you'll encounter will be program or sequential files. If you're not sure which file type to use, try PRG. If the file won't load correctly, delete it and run File Retriever again, trying a different file type.

If File Retriever doesn't find any retrievable files, a dialog box appears telling you that the search has been completed and no files were retrieved. You'll also see this dialog box if you decide not to retrieve any of the files found by File Retriever. Click the mouse or joystick button to return to the main menu. If you retrieve one or more files, a dialog box tells you that File Retriever has finished. Click to return to the main menu.

If you've retrieved a Commodore relative file (REL), you'll see an additional dialog box asking you

to validate the disk from the deskTop. This is the only time you'll need to validate the disk. Do not validate a GEOS disk with Commodore's validate command; use GEOS's validate command instead.

How It Works

Files that are deleted by being tossed into the trash can or by being targets of the scratch command are not actually erased from disk. Their directory entries aren't even removed from the disk directory. Two things happen when a file is scratched. First, the file's directory entry is marked with a 0 to indicate that the file has been scratched. Second, the block availability map (BAM), an area of the disk that keeps track of which disk sectors are currently available for use, is updated to include the sectors in which the deleted file was stored.

File Retriever reverses this process. It restores the directory entry and tells the BAM that the sectors where the file was stored are no longer available for use. This last point is the key to why any unscratch program—including File Retriever—will be 100-percent effective only if there have been no disk operations between the time the file was scratched and the time you run the unscratch program. If you've saved any programs to the disk or have used programs that write to the disk (all GEOS desk accessories write a temporary file to the disk), DOS may have written over the sectors on which your file was stored. If this is the case, there is no way to recover the lost file.

See program listings on page 90.

Coming Next Month

Two GEOS Word Processors Go Head to Head

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* Single disks for *COMPUTE!'s Gazette* are $15.00. Disk/magazine combinations are $16.00 NOTE: No disks dated prior to June 1986 are available. The October, 1987 *Gazette* disk is no longer available.
* Back issues of *COMPUTE!'s PC Magazine* are $16.00 each. This publication is available only as a magazine/disk combination. Our back issue inventory consists mainly of magazines with 5.25-inch disks. The following issues are **NOT** available: ***PC Magazine:*** 9/87, 11/87.
* Back issues of *COMPUTE!'s Amiga Resouce* magazine are available beginning with Spring, 1989 for $6.00 each. Back issues of *COMPUTE'S Amiga Resource Disk* are available beginning with Summer, 1989 for $10.00 each. Disk/magazine combinations are $12.00.

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Flight notes # 8A

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feedback

Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

"Gridloc" for the Plus/4

I found that the program "Gridloc" for the 128 (in February *Gazette*) would run on my Plus/4 after some slight modifications. The changes made primarily involve the WINDOW and SOUND statements.

To convert the program's WINDOW statements (in lines 260, 280, 380, 520, and 630), in each occurrence, substitute the following:

```
POKE 2023,{top left column}:POKE
  2022,{top left row}:POKE 2024,{bottom
  right column}:POKE 2021,{bottom right
  row}
```

After a window's defined, use PRINT CHR$(147) to clear it. To set up a window without clearing it, use PRINT CHR$(19).

For example, the statement WINDOW 27,17,37,22,1 in line 260 defines a window with an upper left corner at column 27, row 17, and a lower right corner at column 37, row 22. The last parameter, with a value of 1, clears the window. (A 0 would leave the contents of the window intact.)

On the Plus/4, this statement converts to

```
POKE 2023,27:POKE 2022,17:POKE
  2024,37:POKE 2021,22:PRINT
  CHR$(147)
```

To convert the SOUND statements (in lines 320, 330, 340, 430, and 640), divide the frequency (the second parameter) by 64. For example, the SOUND statement in line 430 becomes

```
SOUND1,(FNR(2000)+8000)/64,5
```

Also, to hear the sound on the Plus/4, you need to define the volume level. To do this, add the line below:

```
5 VOL 8
```

The final modification in the program has to do with the line lengths. On the Plus/4, lines that are longer than 88 characters will produce a ?STRING TOO LONG error. To prevent this error, split up any program lines that exceed this length.

Nolan Neathercutt
Dallas, TX

Thanks for bringing this to our attention. We're sure Plus/4 owners will appreciate your efforts in this conversion.

SpeedScript Modifications

I have a problem with *SpeedScript* 3.2. Some commands (Delete, Erase, Load) cause the background color in the command line window to change to red or green. Since I'm color-blind, it's difficult for me to read the resulting prompt. For instance, there have been times when I wanted to erase a word but instead erased an entire paragraph.

Currently, my default colors are light gray text on a black background. I would appreciate it if you could show me how to modify *SpeedScript* so it would display all command line messages with a black background.

Tony Norona
Kingston, Ontario

I would like to use *SpeedScript* 3.2 with my new 1581 drive. This drive is device number 9 in my system setup. Could you tell me how to do this?

Michael Hutten
Little Valley, NY

SpeedScript 3.2 has six commands which cause a change in the background color of the command line. They are SHIFT-CLR/HOME (erase all text), CTRL-D (delete), CTRL-E (erase), RESTORE (exit the program), CTRL-I (toggle insert mode), and F7 (load).

With the first four commands, you can use any of the 64's 16 colors (values 0–15) as the command line background color. With the last two commands, any color other than black (a color value of 0) can be used.

To make a permanent copy of SpeedScript *with any color changes, load it into memory (don't run it) and POKE the color values you've selected into the appropriate memory locations. The table below provides the POKE addresses along with the range of suitable color values for each command:*

Command	*Location*	*Color Values*
SHIFT-CLR/HOME	*4288*	*0–15*
CTRL-D	*3858*	*0–15*
CTRL-E	*4556*	*0–15*
RESTORE	*2596*	*0–15*
CTRL-I	*4258*	*1–15*
F7	*5085, 5104*	*1–15*

For example, to cause the command line to change to purple (color number 4) whenever you press SHIFT-CLR/HOME, you'd enter POKE 4288,4.

To check the appearance of your color selections, run the program and try each command. If you're not satisfied with the results, just press RESTORE to exit the program and POKE in some other color values. When you've finished making color changes, be sure to save a copy of the program to disk or tape.

To change the device number for the disk drive to 9, follow a similar procedure. Load a copy of SpeedScript *into memory and enter the two lines below from immediate mode:*

```
POKE 4843,9:POKE 4908,9:POKE
  5274,9:POKE 5873,9:POKE 5967,9
POKE 6367,9:POKE 6883,9:POKE
  7003,9:POKE 7073,9
```

All disk commands will now access device number 9. (If you've assigned your disk drive a number other than 9, substitute it for the value

POKEd in these two lines.)

Again, be sure to save a copy of this modified SpeedScript *before you run it.*

Is Anyone Out There?

I'm currently working on a disk and print utility program for my 128 and would like to know how to check if the disk drive or printer is on. I've tried every approach I can think of, but still I come up with a DEVICE NOT PRESENT error.

Jay Vanover
Seoul, South Korea

The following routine determines whether the disk drive—or any other device—is online without breaking out of the program:

```
10 N=8:POKE 6,N:REM N IS THE
   DEVICE NUMBER
20 POKE 144,0:SYS 65457:S=ST:SYS
   65454:S=S OR ST
30 IF S THEN PRINT"DEVICE"N"NOT
   ONLINE."
```

To check whether the printer is online, set N equal to 4 in line 10. (If your printer is device 3, set N equal to 3.)

This three-liner checks the status of the serial bus after executing low-level Kernal routines. First, line 10 stores the device number, N, into the accumulator shadow register. (To use this routine on a 64, change POKE 6,N to POKE 780,N.)

Line 20 clears the Kernal status register (at location 144) and calls the Kernal routine LISTEN (SYS 65457). LISTEN causes the specified device on the serial bus to begin receiving data. The status register is then read and stored as S. If LISTEN is successful—that is, if the device is online and ready to receive data—S will be 0. Otherwise, S will contain a nonzero value.

The next SYS calls the Kernal UNLSN (unlisten) routine (at location 65454), which instructs all serial devices to stop accepting data. The status register is read a second time. If it contains a nonzero value, an error has occurred.

Last, the two status-register values are combined (ORed). If either SYS returns a nonzero value, the message in line 30 prints.

This routine is more comprehensive than the BASIC routine offered in January "Feedback" under the heading "Printer: Are You There?," but some printers may hang up if the printer is turned on but isn't online. Should this occur, you can continue without falling out of the program by simply putting the printer online.

Identifying Disks

I have some questions regarding the process of changing the disk ID number. From what I understand, when the disk is formatted, each block header has the ID contained in it. When the ID is changed with a utility or sector editor, only the ID listed on track 18, sector 0 is changed. Does this confuse the drive?

When you change a disk, does the drive read the ID at the block header or in the directory name? Should it become a standard procedure to use the "I0:" command whenever a disk is changed in order to avoid problems? If the ID is changed, can it create any problems, and if so, what are they, and what should be done to avoid them?

Jim Saraceno
Glendale, MO

It's true that the disk drive writes the disk ID in the header of every sector when it formats a disk. The two-character ID that is visible in track 18, sector 0 is used by the disk drive only to build a disk directory. You can change it to anything you wish without confusing the drive.

Each time the disk drive performs an operation, it reads the disk ID from a sector header on the disk. If the ID doesn't match the one it has in memory, the drive assumes it has a new disk and reads the block availability map (BAM) from the disk. If the ID matches, the drive assumes the disk hasn't been changed and uses the copy of the BAM it has in memory.

Sending "I0:" every time you change disks is overkill. It doesn't hurt anything, but it's not really necessary if each disk has a unique ID. If you have several disks with the same ID, using "I0:" may be the only way you can prevent disaster.

The only possible harm that could come from changing an ID in track 18, sector 0 is that you may think that two disks have different IDs when in fact they do not. This would only become a problem if you were swapping the two disks in and out of the same drive.

Proofreading with a TV

My problem has to do with the program "The Automatic Proofreader," written by Philip Nelson. The problem is that I am using a TV for a monitor and the TV has no adjustment for positioning the picture. The result is that the Proofreader checksum is placed in the home position, where it is very difficult to see.

Could you tell me how to move the checksum to the top middle of the screen?

Charles R. Taylor
Trenton, OH

While it is possible to move the checksum to the top middle of the screen, it would require rewriting "The Automatic Proofreader." A simpler change involves moving the checksum to the right by one character or down one line.

Three lines must be changed to move the checksum. To move the checksum down one line, change the number 20570 in line 80 to 20565, the 22054 in line 110 to 22049, and the 18 in line 190 to 13. To move the checksum to the right one character, change the 20570 in line 80 to 20584, the 22054 in line 110 to 22068, and the 18 in line 190 to 32.

The Proofreader checksum normally appears on the screen in reverse video. The changes given above substitute cursor-control commands for the reverse-video command. Although the checksum no longer appears in reverse video, with it repositioned, you should now be able to see it on most TVs. **G**

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The Newsletter Awards

Randy Thompson

"Programmer's Page" columnist Randy Thompson needed space to present his user group newsletter awards. I hereby donate this month's column to him.
—Rhett Anderson

It never fails. Approximately once a month I enter my office and find a large pile of user group newsletters stacked high on my desk or chair.

COMPUTE! gets hundreds of newsletters. Most originate from the United States, but many arrive from other countries such as Mexico, Canada, and even Australia.

One reason we receive so many newsletters is to keep our records up-to-date. When newsletters arrive at our office, they're given to editorial assistant Mickey McLean. Mickey logs them in and notes all the new user groups for his "User Group Update" column. Come spring, the entire list is published in our annual guide to user groups.

The newsletters then pass from Mickey to Rhett Anderson (the fellow who usually writes this column) to me. I peruse the issues—photocopying any information that I find interesting, useful, or just plain humorous—and then pass them along to program designer Bill Chin, who hands them to technical editor Dale McBane, who gives them to . . . well, you get the idea.

I like to read user group newsletters because they keep me in touch with the real world. I get to hear about everyday computer users. I learn how and why they use their computers and what their interests are.

Most newsletters look generally the same. The first page holds some sort of commentary written by the user group's president or editor—"The Prez Sez" or "From the Editor's Desk" are two common titles for this section. Inside you'll often find the minutes from the last user group meeting, followed by product reviews, news, and, finally, the contents of the most recent club disk. Calendars make popular back-page material; they serve as a practical reminder of that month's user group events.

My favorite section in a newsletter is where magazines such as *Gazette* are reviewed. Call it vanity, but I like to know what other people think of the magazine I help produce. I also like to know what they think of our competitors.

With all the newsletter editors evaluating us, I thought it only appropriate that we evaluate them. The result? *Gazette*'s possibly annual Newsletter Awards.

And the Winners Are

The following awards have not been selected by a large panel of judges and the results were not tallied by a major accounting firm whose title spans three names. They were decided by three people: Rhett Anderson, Bill Chin, and me.

Best Cover goes to the Society of Computer Owners and PET Enthusiasts (SCOPE), of Richardson, Texas, whose April newsletter sports a cover that is completely backward—title, picture, date, everything. The cover shows the back side of an Amiga 2000 with the earth-shattering caption NEW VERSION OF THE GAME "REVERSI" FOR THE AMIGA. To read this exciting headline, you have to hold the newsletter up to a mirror, of course.

Most Interesting and Unusual Newsletter goes to the Prisoner's User Group (PUG). Touted as the "Computing Behind Bars" publication, this newsletter is the product of the residents of the Monroe Washington State Correctional Institute. It's well written and interesting to read. Apparently, the inmates have access to several brands of computers, including 64s and 128s. They are allowed to have a computer system in their cell, but they must keep it quiet after 10 p.m. so that others can sleep (no loud game playing at midnight).

Best Calendar goes hands-down to Lane County Commodore User Group (LCCUG), of Eugene, Oregon. Their computer-generated calendars include clip art and at least one interesting quote, user group event, or historical piece of trivia for *every* day of the month. For example, did you know that a blizzard caused an ice jam to block Niagara Falls for 30 hours on March 29, 1848? I regularly photocopy the LCCUG calendar for my use and for the use of three other COMPUTE! editors.

Most Touching Editorial goes to Finger Lakes Commodore User Group (Flugger), of Geneva, New York. This article, which appears in the Flugger March/April 1989 newsletter, details a serious auto accident involving one of the user group's most loyal supporters and best writers, Kevin Beagle. Because of the accident, Kevin has lost much of his memory and all of his motor-control functions. One of Kevin's software reviews follows the Flugger editorial—it's very good.

Our **Most Appropriate Use of Plagiarism** award goes to a Mexican newsletter whose name unfortunately eludes me. What attracted me to this particular newsletter was an article that was a word-for-word Spanish translation of one of my previous "Programmer's Page" columns. Honestly, I'm flattered, and I'm glad that the information in that column is being put to use. My only complaint is that they removed my byline and any reference to *Gazette*. Oh well, at least it won an award—even if I did nominate it. **G**

d'iversions

Where Have All the Robots Gone?

Fred D'Ignazio

The other day I received a letter from Brigitta Malm, of New Orleans, Louisiana. Brigitta had just finished reading my article about my travels around the U.S. and Canada with HERO, JR., the "pet" robot from Heath Company. The article had so inspired Brigitta that she went out and purchased a HERO, JR. of her own. Here's her description of what life has been like with a robot:

> My only previous exposure to robots was a remote-controlled unit in a shopping center. So having my very own robot has been quite an adventure for me. Buttons has been with us for a year now and the house is showing unmistakable signs of his (its) presence: marks on table legs he tried to climb, a few dark streaks on the floor from twirling around too fast. And although he will never learn why the walls have to be where he would like to explore, he has been a most enjoyable companion—a toy, a pet, a new dimension, and a fantasy come true. He's also given surprising insights into friends and relatives.
>
> Reactions have been verbal abuse from an otherwise technically inclined person with experience in robotics; jealousy; hesitation and fear of new technology; the suggestion from a grandmother that if I wanted a child, I could have borrowed her grandson; screams from a toddler; and, yes, enthusiasm. Unexpectedly, outright acceptance and delight have come mostly from an 80-year-old uncle and two other octogenarian friends in England. Indeed, the robot sang "Happy Birthday" over the telephone to one of them. Maybe only elderly people have enough wisdom and fortitude to accept a mere moving computer without feeling threatened, while younger ones are strictly guided by utilitarian considerations ("If it can't clean a house, forget it!").

Robots Everywhere

Brigitta's letter made me feel a sharp pang of nostalgia—a longing for the days, just a few years ago, when robots had captured the public's imagination. The *Star Wars* movies had just come out, and everyone idolized cute, little R2D2 and his sidekick, C3PO. Every kid had a box full of GoBots and Transformer robots. CBS Toys came out with a programmable warrior robot named Max. The Big Trak tank robot from Milton Bradley was a big hit, as were the Chatbot and the little Dingbot robots from Tomy. Androbots introduced Topo, the world's first (and last) robot snowman. Robot arms seemed to sprout up from every personal computer's desktop. Hubotics created Hubot, the first robot appliance, complete with a TV set, a videogame, a storage cabinet, and a cutting board. And Heath came out with its HERO and HERO, JR. robots, modeled after the incredibly popular R2D2.

The programmable robots were especially fun. Robot turtles—programmed in Logo—were especially in vogue. The little robots looked like inverted soup bowls rolling around on wagon wheels. They were connected to a computer by long tether cords, which were were long enough to let the robots get into plenty of trouble.

My favorite robots in those days were the odd little robots in the MOVITS family from OWI Electronics. The engineers who designed the MOVITS had offbeat and quirky imaginations. Each member of the MOVITS family had a completely different kind of body and personality. For one of my TV shows we set up a robot zoo in our kitchen. Robot monkeys climbed along strings tied to the kitchen cabinets. Robot spiders slinked along kitchen counters. Kangaroos hopped off the kitchen table. Inverted flying saucers and robot buggies rolled around the floor.

The little robots were all the size of a plump guinea pig and were made of clear plastic so you could see their insides. They were under microprocessor control and usually featured a sensor that guided their activities. Some robots—the "wall bangers"—had pressure sensors. The "seeing" robots could sense light and would either approach a bright light or try to avoid it. One robot, six-legged Mr. Bootsman, had an audio sensor. When he heard you clap or whistle, he would stop marching in one direction and immediately goose-step off in a new direction.

A Robot Roundup

Brigitta's letter was a real thrill. Until I received it, I had thought that robots had become as extinct as the dinosaurs and dodo birds.

Are there other robots out there?

Robot owners of the world, let me hear from you. Where have all the robots gone? If you own a robot, please write me and tell me about it. Write to

Fred D'Ignazio
c/o COMPUTE!'s Gazette
324 West Wendover Avenue, Suite 200
Greensboro, North Carolina 27408

I'll gather your letters together and publish a Robot Roundup in an upcoming column. Who knows?—this may be the start of a Robot Support Group for parents of orphaned robots. **G**

User Group Update

Compiled by Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1988 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

Note: COMPUTE! Publications does not condone the use of its user group lists by individuals or user groups for the purpose of buying, selling, or trading pirated software. Should we discover any group participating in any such illegal and unethical activity, the club's listing will be permanently deleted from our files.

User Group Notes

The **Chicksands Computer Club (C cubed),** an armed services club located in England, can be reached directly by writing to Chicksands Computer Club, Attn: Recreation Center, RAF Chicksands, Shefford Beds., England SG17 5PZ, or by sending correspondence through its APO address: P.O. Box 148, 6950th ESG, APO New York, NY 09193.

New Listings

ALABAMA

Montgomery Area Commodore Komputer Society (MACKS), P.O. Box 210126, Montgomery, AL 36121-0126

CALIFORNIA

Orange County Commodore Club (OCCC), 7950 Puritan St., Downey, CA 90242

Hi Desert Commodore Users Group, 62026 Sunburst Cir., Joshua Tree, CA 92252

Ventura/Oxnard Commodore User Group, 4157 Sunset Ln., Oxnard, CA 93035

Valley Commodore Users Group, P.O. Box 3228, Salinas, CA 93912

Access Computer Club, P.O. Box 3175, Livermore, CA 94550

Valley Computer Club, P.O. Box 310, Denair, CA 95316

Marysville-Yuba City Hub Area Commodore Club (HACC), 7127 Arrowhead Tr., Browns Valley, CA 95918-9630

North Valley Commodore Users Group (NVCUG), P.O. Box 7658, Chico, CA 95927

CONNECTICUT

Hartford County Commodore Users Group, Inc., P.O. Box 8553, East Hartford, CT 06108

The Naugatuck Valley Commodore Users Group, P.O. Box 622, Waterbury, CT 06720

FLORIDA

Commodore Milton User Group (CMUG), P.O. Box 225, Milton, FL 32572

Starcom User's Group Martin County, P.O. Box 1446, Port Salerno, FL 33492

GEORGIA

Commodore Users Group of Columbus, Georgia, 960 B Michael St., Columbus, GA 31905-5122

HAWAII

Mililani User Group, 276 Olive Ave., #6, Wahianwa, HI 96786

Maki Commodore User Group (MCUG), P.O. Box 6381, Honolulu, HI 96818

INDIANA

Commodore Computer Club, P.O. Box 2332, Evansville, IN 47714

MAINE

Island/Reach Computer Users Group, Inc., P.O. Box 73, Deer Isle, ME 04627 (BBS# 207-374-2303)

MARYLAND

North Baltimore Users Group (NOBUG 64/128), P.O. Box 18835, Baltimore, MD 21206

MICHIGAN

Tri-County Computer Club, 607 E. Dowland St., Ludington, MI 49431

Northern Michigan Commodore Club (NMCC), P.O. Box 3066, Gaylord, MI 49735 (BBS# 517-732-2275)

MISSOURI

Barton County Commodore Users Group (BCCUG), 307 W. 11th, Lamar, MO 64759

OHIO

NorthEast Ohio Computer Users Group (NEOCUG Inc.), P.O. Box 196, Wickliffe, OH 44092

Portage County Commodore Family User Group (PCCFUG), P.O. Box 901, Ravenna, OH 44266 (BBS# 216-296-3692)

PENNSYLVANIA

Worldwide Commodore Users Group (International Headquarters), P.O. Box 337, Blue Bell, PA 19422

TEXAS

Texas Commodore User's Group, P.O. Box 623, Royse City, TX 75089

The Wichita County Commodore User's Co-op, 240 Kitchings St., Wichita Falls, TX 76301 (BBS# 817-761-3610 or 817-696-2520)

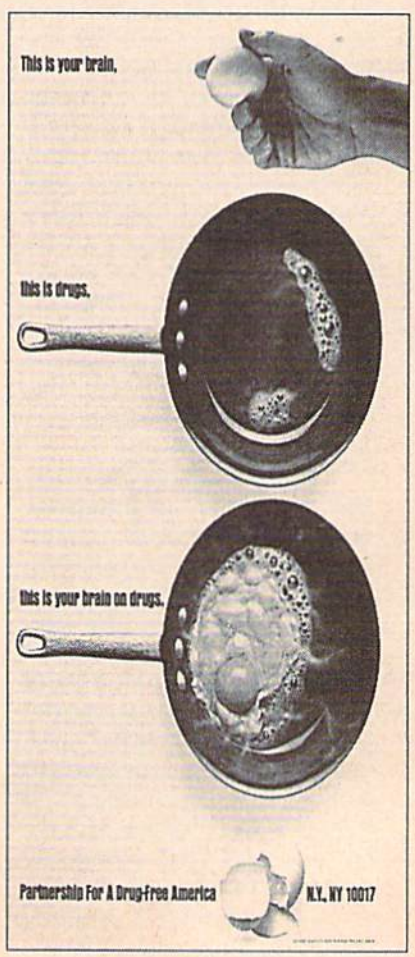
WASHINGTON

Prisoner's User Group, P.O. Box 777, Monroe, WA 98272

Outside the U.S.

CANADA

Commodore User Group, R.R. 1, Havelock, New Brunswick, Canada E0A 1W0



MLX Machine Language Entry Program For Commodore 64

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of Commodore 64 machine language programs.

Type in and save some copies of MLX—you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE. When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

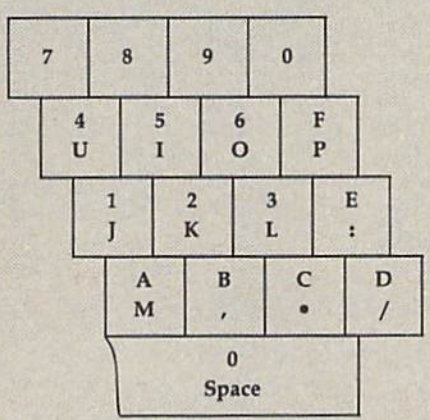
Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing.

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, the numeric keypad modification from the March 1986 "Bug-Swatter" column is now incorporated in the listing. The keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figure below shows the keypad configuration:



MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redis-

played. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save. Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands. Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP-RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk or LOAD *"filename"*,1,1 for tape, and then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, and then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to insure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}{8 @}
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
      RESS{4}";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS{4}";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N]{4}";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}{4}":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}{4}ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
```

```
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
       [4]";:GOSUB300:IF IN$<>
       N$ THEN GOSUB1030:IF F
       {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
       {SPACE}":GOSUB400:IF IN
       $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
        THEN PRINT IN$:PRINT"
       {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
       =S$:FOR J=1 TO 2:IF F T
       HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
       24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
       $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
       3*(A$=".")-4*(A$="/")-5
       *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
       ")-9*(A$="U")-10*(A$="I
       ")-11*(A$="O")-12*(A$="
       P")
CM 487 A=A-13*(A$=S$):IF A THE
       N A$=MID$("ABCD123E456F
       0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
       =1)OR F)THEN PRINT B$;:
       J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
       ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
       ((I=0)AND(J=1))THEN GOS
       UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
       :J=2-J:IF J THEN PRINT
       {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
       {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:INPUT#3,IN$
       :IF IN$=N$ THEN CLOSE3:
       GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
       MID$(IN$,I):GOSUB320:IF
        I<25 THEN GOSUB380:A(I
       /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
       B1060:PRINT"{BLK}{RVS}
       {SPACE}ERROR: REENTER L
       INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
       LOSE3:PRINT"{DOWN}{BLU}
       ** END OF ENTRY **{BLK}
       {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
       {SPACE}DISPLAY DATA ":G
       OSUB400:IF IN$=N$ THEN2
       20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
        {RVS}SPACE{OFF} TO PAU
       SE, {RVS}RETURN{OFF} TO
        BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
       I=BTO B+7:A=PEEK(I):GOS
       UB350:GOSUB380:PRINT S$
       ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
       :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
       ENPRINT"{DOWN}{BLU}** E
       ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
       SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
       UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
       {SPACE}DATA ":OP=1:GOTO
       710
PC 700 PRINT"{DOWN}{RVS} SAVE
       {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
       NAME[4]";IN$:IF IN$=N$
       {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
       {RVS}T{OFF}APE OR {RVS}
       D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
       INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
       ,15,"I0:":B=EA-SA:IN$="
       0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
       OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
       H*256):PRINT#1,CHR$(AL)
       ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
       R$(PEEK(BS+I));:IF ST T
       HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
       O940
GS 800 GOSUB1060:PRINT"{DOWN}
       {BLK}ERROR DURING SAVE:
       [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
       OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
       $)+256*ASC(B$+Z$):IF AD
       <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
       OKE BS+I,ASC(A$+Z$):IF(
       I<>B)AND ST THEN F=2:AD
       =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
       >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
        CLOSE1:CLOSE15:GOSUB10
       60:PRINT"{RVS}ERROR: "A
       $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
       187,PEEK(FA+3):POKE188,
       PEEK(FA+4):IFOP=0THEN92
       0
HJ 890 SYS 63466:IF(PEEK(783)A
       ND1)THEN GOSUB1060:PRIN
       T"{DOWN}{RVS} FILE NOT
       {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
       30):IF AD<>SA THEN F=1:
       GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
       2)-1:F=F-2*(A<EA)-3*(A>
       EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
       OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
       UB1010:ON OP GOTO950:SY
       S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
        SAVE COMPLETED **":GOT
       O220
XP 950 POKE147,0:SYS 63562:IF
       {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
        LOAD COMPLETED **":GOT
       O220
DP 970 GOSUB1060:PRINT"{BLK}
       {RVS}ERROR DURING LOAD:
       {DOWN}[4]":ON F GOSUB98
       0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
       G ADDRESS (";:GOSUB360:
       PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
       AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
       ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
       *256):POKE193,AL:POKE1
       94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
       *256):POKE174,AL:POKE1
       75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
       1050
HA 1040 IF(AD>511 AND AD<40960
       )OR(AD>49151 AND AD<53
       248)THEN GOSUB1080:F=0
       :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
       {SPACE}INVALID ADDRESS
        {DOWN}{BLK}":F=1:RETU
       RN
AR 1060 POKE SD+5,31:POKE SD+6
       ,208:POKE SD,240:POKE
       {SPACE}SD+1,4:POKE SD+
       4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
       TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
       240:POKE SD,0:POKE SD+
       1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
       KE SD+4,0:POKE SD,0:PO
       KE SD+1,0:RETURN
```

G

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The Automatic Proofreader

Philip I. Nelson

"The Automatic Proofreader" helps you type in program listings for the 128, 64, Plus/4, and 16 and prevents nearly every kind of typing mistake.

Type in the Proofreader *exactly* as listed. Since the program can't check itself, type carefully to avoid mistakes. Don't omit any lines, even if they contain unfamiliar commands. After finishing, save a copy or two on disk or tape before running it. This is important because the Proofreader erases the BASIC portion of itself when you run it, leaving only the machine language portion in memory.

Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP- RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

G

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

SFX Machine

Article on page 50.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
RF 20 PRINT"{CLR}":B=53280:POK
      EB,15:POKEB+1,12:POKEB-1
      5,91:B1=B+2:B2=B+4:C=646
      :D=49152
CS 30 FORJ=0TO10:READN:POKED+J
      ,N:NEXT:DATA169,0,160,23
      ,153,0,212,136,208,250,9
      6
GQ 40 X=211:Y=214:POKEC,1:POKE
      B2,2:POKEY,9:PRINT
GJ 50 PRINTTAB(8)"{RVS}
      {25 SHIFT-SPACE}"
GR 60 PRINTTAB(8)"{RVS}
      {SHIFT-SPACE}COPYRIGHT 1
      989 COMPUTE!
      {SHIFT-SPACE}"
QP 70 PRINTTAB(8)"{RVS}
      {25 SHIFT-SPACE}"
PD 80 Z=1:E=828:K=256:R$=CHR$(
      13):P$=CHR$(32):M=1.005:
      A=40:NK=64:KB=197:V=5427
      2
AA 90 V1=V+1:V2=V:V3=V+8:V4=V+
      7:R=RND(-TI)
QM 100 M1$="{RVS}{SHIFT-SPACE}
       NEW{SHIFT-SPACE}SFX
       {SHIFT-SPACE}":M2$="
       {RVS}{SHIFT-SPACE}KEY
       {SHIFT-SPACE}SFX
       {SHIFT-SPACE}":M3$="
       {RVS}{SHIFT-SPACE}SAVED
       {SHIFT-SPACE}SFX
       {SHIFT-SPACE}KEYS
       {SHIFT-SPACE}"
CJ 110 DIMF1(A),F2(A),F3(A),F4
       (A),G1(A),G2(A),G3(A),G
       4(A),H1(A),H2(A),H3(A),
       H4(A)
AH 120 FORT=1TOA:READN:N1=N*M:
       N2=N*2:N3=N*2*M:N4=INT(
       N/2):N5=INT(N/2*M)
SS 130 F1(T)=INT(N/K):F2(T)=N-
       (F1(T)*K):F3(T)=INT(N1/
       K):F4(T)=INT(N1-(F3(T)*
       K))
BQ 140 G1(T)=INT(N2/K):G2(T)=N
       2-(G1(T)*K):G3(T)=INT(N
       3/K):G4(T)=INT(N3-(G3(T
       )*K))
SC 150 H1(T)=INT(N4/K):H2(T)=N
       4-(H1(T)*K):H3(T)=INT(N
       5/K):H4(T)=INT(N5-(H3(T
       )*K))
BK 160 NEXT:GOSUB570:GOSUB680
PH 170 DATA2145,2273,2408,2551
       ,2703,2864,3034,3215,34
       06,3608,3823,4050,4291,
       4547
EB 180 DATA4817,5103,5407,5728
       ,6069,6430,6812,7217,76
       47,8101,8583,9094,9634,
       10207
BG 190 DATA10814,11467,12139,1
       2860,13625,14435,15294,
       16203,17167,18188,19269
       ,20415
DJ 200 SYS49152:POKEV+23,PO(I)
       :POKEV+24,VO(I)
AQ 210 GETA$:IFA$=""THEN210
RH 220 IFVAL(A$)>0THENGOSUB550
       :GOTO200
JC 230 IFA$="L"THENGOSUB1200:G
       OTO200
DQ 240 POKEV+5,AD(I):POKEV+6,S
       R(I):POKEV+12,AD(I):POK
       EV+13,SR(I):POKEV+3,DB(
       I)
FJ 250 POKEV+10,DC(I):POKEV+17
       ,DD(I):POKEV+14,VI(I):P
       OKEV+18,VS(I)
DQ 260 IFA$="+"THENT=T+1:IFT>A
       THENT=A
PC 270 IFA$="-"THENT=T-1:IFT<1
       THENT=1
GJ 280 IFA$="+"ORA$="-"THEN320
AS 290 IFA$=R$THENI=0:GOSUB680
       :POKEY,8:PRINT:Z=Z+1
QQ 300 IFA$=R$THENPOKEC,7:POKE
       B1,1:PRINT"{4 SPACES}"M
       1$;Z"{LEFT} ":GOTO200
HD 310 IFA$="S"THENGOSUB1070:G
       OTO200
MK 320 ONOC(I)GOTO330,340,350
PB 330 POKEV1,F1(T):POKEV2,F2(
       T):POKEV3,F3(T):POKEE,F
       3(T):POKEV4,F4(T):GOTO3
       60
HQ 340 POKEV1,G1(T):POKEV2,G2(
       T):POKEV3,G3(T):POKEE,G
       3(T):POKEV4,G4(T):GOTO3
       60
HE 350 POKEV1,H1(T):POKEV2,H2(
       T):POKEV3,H3(T):POKEE,H
       3(T):POKEV4,H4(T)
MC 360 ONZ(I)GOTO400,370,380,3
       90,370
QF 370 POKEV+15,F1(T)/.7:GOTO4
       00
PB 380 POKEV+15,F1(T)/2:GOTO40
       0
XF 390 POKEV+11,W2(I):FORJ=1TO
       50:NEXT
FA 400 IFA$<>R$THENPOKEV+4,W1(
       I):POKEV+11,W2(I)
BD 410 ONFL(I)GOTO420,430,440,
       450
FD 420 GOSUB530:GOTO460
FP 430 FORU=1TOSL(I)STEP10:POK
       EV+22,U:NEXT:GOTO460
KD 440 J=1:L=255:FORU=1TO10:PO
       KEV+1,J:POKEV+8,L:J=J+I
       1(I):L=L-I2(I):NEXT:GOT
       O460
BB 450 POKEV3,PEEK(E)/2
DE 460 IFZ(I)=2THENFORU=1TOSL(
       I)STEPXT(I):POKEV+1,U:N
       EXT
XP 470 IFZ(I)=5THENFORU=SL(I)T
       O1STEP-XT(I):POKEV+23,1
       :POKEV+1,U:POKEV+23,PO(
       I):NEXT
EM 480 IFPEEK(KB)<>NKTHEN480
QS 490 IFZ(I)=6THENPOKEV+4,21:
       POKEV+11,21
MM 500 POKEV+4,W1(I)-1:POKEV+1
       1,W2(I)-1
ME 510 IFA$="R"THENGETB$:IFB$=
       ""THEN320
RC 520 GOTO210
HE 530 POKEV,PEEK(V+27):POKEV+
       7,PEEK(V+27):IFPEEK(KB)
       <>NKTHEN530
QJ 540 RETURN
EB 550 I=VAL(A$):IFOC(I)=0THEN
       I=0:RETURN
AK 560 T=T(I):POKEY,8:PRINT:PO
       KEC,3:POKEB2,0:PRINT"
       {4 SPACES}"M2$;I"{LEFT}
       {2 SPACES}":POKEC,1:RET
       URN
RK 570 POKEC,1:PRINT"{CLR}
       {DOWN} {RVS}SPACE{OFF}
       {SPACE}TO HEAR SFX
       {5 SPACES}{RVS}+{OFF} T
       O RAISE PITCH
ES 580 PRINT"{DOWN} {RVS}S
       {OFF} TO SAVE SFX
       {9 SPACES}{RVS}-{OFF} T
       O LOWER PITCH
CG 590 PRINT"{DOWN} {RVS}L
       {OFF} TO LOAD SFX
       {7 SPACES}{RVS}RETURN
       {OFF} FOR NEW SFX
JD 600 PRINT"{DOWN} {RVS}R
       {OFF} TO REPEAT SFX (AN
       Y KEY TO STOP)
MX 610 PRINT"----------------
       ----------------------
       "
FH 620 IFS$=""THENPOKEY,8:PRIN
       T:POKEC,7:POKEB1,1:PRIN
       T"{4 SPACES}"M1$;Z"
       {LEFT} "
CQ 630 POKEY,8:PRINT:POKEC,7:P
       OKEB1,1:PRINT"
       {2 SPACES}"S$
FC 640 POKEY,8:PRINT:POKEX,20:
       POKEB2,0:POKEC,3:PRINTM
       3$:PRINT
XA 650 IFP=0THENPOKEY,11:PRINT
       :POKEX,24:PRINT"(NONE)
AQ 660 IFZG>0THENFORU=1TOZG:PO
       KEX,26:PRINTU:NEXT
QB 670 RETURN
GP 680 Z(I)=INT(5*RND(1))+1:FL
       (I)=INT(5*RND(1))+0:OC(
       I)=INT(3*RND(1))+1
ER 690 T=INT(A*RND(1))+1:I1(I)
       =INT(25*RND(1))+1:I2(I)
       =INT(25*RND(1))+1
MH 700 SL(I)=INT(255*RND(1))+1
QB 710 J=INT(7*RND(1))+1:ONJGO
       TO720,730,740,750,760,7
       70,780
KK 720 W1(I)=17:GOTO790
RM 730 W1(I)=33:GOTO790
RS 740 W1(I)=65:GOTO790
AG 750 W1(I)=129:GOTO790
BK 760 W1(I)=21:GOTO790
DX 770 W1(I)=23:GOTO790
GH 780 W1(I)=85
AQ 790 J=INT(7*RND(1))+1:ONJGO
       TO800,810,820,830,840,8
       50,860
JR 800 W2(I)=17:GOTO870
QS 810 W2(I)=33:GOTO870
RC 820 W2(I)=65:GOTO870
GM 830 W2(I)=129:GOTO870
AR 840 W2(I)=21:GOTO870
DD 850 W2(I)=23:GOTO870
JM 860 W2(I)=85
QF 870 AT=INT(8*RND(1))+1:DE=I
       NT(15*RND(1))+1
ER 880 SU=INT(15*RND(1))+1:RE=
       INT(15*RND(1))+1
MM 890 AD(I)=AT*16+DE:SR(I)=SU
       *16+RE
BS 900 J=INT(4*RND(1))+1:ONJGO
       TO910,920,930,940
HD 910 PO(I)=241:GOTO950
XC 920 PO(I)=242:GOTO950
HA 930 PO(I)=243:GOTO950
AG 940 PO(I)=240
QJ 950 XT(I)=INT(40*RND(1))+10
QS 960 J=INT(4*RND(1))+1:ONJGO
       TO970,980,990,1000
FB 970 VS(I)=17:GOTO1010
BC 980 VS(I)=33:GOTO1010
BG 990 VS(I)=65:GOTO1010
DS 1000 VS(I)=129
PM 1010 VI(I)=INT(200*RND(1))+
        55
CS 1020 DB(I)=INT(8*RND(1))+1:
```

```
        DC(I)=INT(8*RND(1))+1:
        DD(I)=INT(8*RND(1))+1
SC 1030 J=INT(3*RND(1))+1:ONJG
        OTO1040,1050,1060
GB 1040 VO(I)=31:RETURN
SF 1050 VO(I)=45:RETURN
AX 1060 VO(I)=79:RETURN
EP 1070 GOSUB1310:IFP=>9THEN11
        20
JB 1080 POKEC,1:PRINT"TO {RVS}
        K{OFF}EYBOARD OR {RVS}
        D{OFF}ISK?
CX 1090 GETA$:IFA$<>"K"THENIFA
        $<>"D"THENIFA$<>R$THEN
        1090
XS 1100 IFA$=R$THEN1190
KR 1110 IFA$="K"THEN1320
KE 1120 PRINTCHR$(147)
CJ 1130 INPUT"{BLK}SAVE FILENA
        ME ($ - DIR) ";S$:IFS$
        ="$"THEN GOSUB 1300:GO
        TO1130
EP 1140 IFS$=""THEN1190
AX 1150 OPEN1,8,1,S$:PRINT#1,T
        :PRINT#1,OC(0):PRINT#1
        ,I1(0):PRINT#1,I2(0):T
        (I)=T
EG 1160 PRINT#1,Z(0):PRINT#1,F
        L(0):PRINT#1,W1(0):PRI
        NT#1,W2(0):PRINT#1,AD(
        0)
XG 1170 PRINT#1,SR(0):PRINT#1,
        PO(0):PRINT#1,XT(0):PR
        INT#1,VI(0):PRINT#1,VS
        (0)
RX 1180 PRINT#1,DB(0):PRINT#1,
        DC(0):PRINT#1,DD(0):PR
        INT#1,VO(0):PRINT#1,SL
        (0)
HB 1190 GOSUB570:CLOSE1:RETURN
FJ 1200 PRINTCHR$(147)
RF 1210 INPUT"{BLK}LOAD FILENA
        ME ($ - DIR) ";S$:IF S
        $="$" THEN GOSUB 1300:
        GOTO1210
AB 1220 IFS$=""THENGOSUB570:GO
        TO1290
QP 1230 OPEN1,8,0,S$:INPUT#1,T
        :INPUT#1,OC(0):INPUT#1
        ,I1(0):INPUT#1,I2(0)
QP 1240 INPUT#1,Z(0):INPUT#1,F
        L(0):INPUT#1,W1(0):INP
        UT#1,W2(0):INPUT#1,AD(
        0)
EC 1250 INPUT#1,SR(0):INPUT#1,
        PO(0):INPUT#1,XT(0):IN
        PUT#1,VI(0):INPUT#1,VS
        (0)
JQ 1260 INPUT#1,DB(0):INPUT#1,
        DC(0):INPUT#1,DD(0):IN
        PUT#1,VO(0):INPUT#1,SL
        (0)
DA 1270 GOSUB570
SX 1280 POKEY,8:PRINT:POKEC,7
JP 1290 CLOSE1:I=0:RETURN
DG 1300 PRINT"{CLR}{WHT}":GOSU
        B1370
KD 1310 S$="":POKE198,0:PRINT:
        RETURN
JC 1320 P=P+1:I=P:T(I)=T
CB 1330 OC(I)=OC(0):I1(I)=I1(0
        ):I2(I)=I2(0):Z(I)=Z(0
        ):FL(I)=FL(0):W1(I)=W1
        (0)
HR 1340 W2(I)=W2(0):AD(I)=AD(0
        ):SR(I)=SR(0):PO(I)=PO
        (0):XT(I)=XT(0):VI(I)=
        VI(0)
CJ 1350 VS(I)=VS(0):DB(I)=DB(0
        ):DC(I)=DC(0):DD(I)=DD
        (0):VO(I)=VO(0):SL(I)=
        SL(0)
HH 1360 ZG=ZG+1:GOSUB570:GOTO5
        60
KE 1370 OPEN15,8,15:OPEN1,8,0,
        "$0"
HJ 1380 GET#1,A$,A$
MP 1390 GET#1,A$,A$
BD 1400 S=ST:IFS<>0THENCLOSE1:
        GOTO1460
DJ 1410 GET#1,LO$,HI$
KG 1420 LO=ASC(LO$+CHR$(0)):HI
        =ASC(HI$+CHR$(0)):LN=L
        O+HI*256:LN$=MID$(STR$
        (LN),2)
KH 1430 PRINTLN$+" ";
SQ 1440 GET#1,B$:IFB$=""THENPR
        INTCHR$(13);:GOTO1390
KK 1450 PRINTB$;:GOTO1440
HH 1460 INPUT#15,EN,EM$,ET,ES:
        IFEN<>0THENPRINTEN;EM$
        ;ET;ES
CD 1470 CLOSE15:RETURN
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Mine Sweeper

See instructions in article on page 27 before typing in.

```
0801:11 08 0A 00 9E 20 28 32 D4
0809:30 36 38 29 20 42 43 00 E8
0811:00 00 FF 20 1F 16 20 1E D2
0819:09 EE 1D 09 AD 1D 09 C9 5B
0821:05 D0 02 A9 00 8D 1D 09 3C
0829:8D 1A 09 20 3F 12 A9 00 3F
0831:8D 15 D0 A9 01 8D 15 09 73
0839:A2 08 A0 00 18 20 F0 FF D3
0841:20 72 13 20 8C 0B AD 65 B3
0849:08 C9 01 F0 0E A5 C5 C9 5B
0851:02 D0 12 A9 01 8D 65 08 84
0859:4C 66 08 A5 C5 C9 39 D0 1D
0861:04 4C 07 16 00 A9 01 20 91
0869:18 0A AD 00 DC C9 74 B0 65
0871:D2 20 CD 12 20 7B 08 4C 19
0879:14 08 20 1E 09 A9 00 8D F7
0881:11 0E 20 D5 13 20 3F 12 A8
0889:20 8C 0B 20 4F 13 20 E9 21
0891:11 20 5B 0D 20 54 11 20 03
0899:B2 11 A5 A1 20 85 12 20 71
08A1:8C 0B 20 10 0F 20 31 0A 25
08A9:20 A7 0B AD 1C 09 C9 03 8B
08B1:D0 10 EE 1A 09 20 AB 0D DA
08B9:AD 1A 09 C9 05 D0 C6 4C 2A
08C1:AC 14 A9 01 20 18 0A AD 95
08C9:17 09 C9 01 D0 C9 A5 A1 8B
08D1:8D 1B 09 A9 00 8D 17 09 98
08D9:A2 0A A0 0A 18 20 F0 FF 95
08E1:CE 19 09 AD 19 09 C9 00 1C
08E9:F0 0C 20 54 11 20 4F 13 79
08F1:20 AB 0D 4C 8F 08 20 FC 3D
08F9:12 A9 FF 20 18 0A A9 FF BB
0901:20 18 0A A9 FF 20 18 0A BF
0909:A9 FF 20 18 0A 20 AB 0D AA
0911:20 CD 12 60 01 DA 00 00 62
0919:FF 00 00 00 00 A9 1D 8D 99
0921:18 D0 A9 00 8D 21 D0 8D C8
0929:20 D0 A9 D8 8D 16 D0 A9 52
0931:FF 8D 1C D0 A9 0B 8D 25 F0
0939:D0 A9 01 8D 26 D0 A9 D3 B2
0941:8D F9 07 A9 D4 8D 9D 0C 38
0949:8D 9E 0C 8D 9F 0C A9 DB 80
0951:8D A0 0C A9 DC 8D A1 0C DA
0959:A9 01 8D 28 D0 A9 00 8D 6F
0961:1E D0 8D 1F D0 20 BA 13 E9
0969:A9 80 8D 12 D4 A9 02 8D 22
0971:0E D4 A9 00 8D 0F D4 A9 F0
0979:09 8D 19 09 A9 93 20 D2 D5
0981:FF 20 CA 10 A9 00 8D 1A 78
0989:09 8D AE 11 8D AF 11 8D 45
0991:B0 11 8D B1 11 60 A0 1E 76
0999:99 20 DB 88 C0 FF D0 F8 25
09A1:A0 1E 99 48 DB 88 C0 FF C5
09A9:D0 F8 A0 1E 99 70 DB 88 27
09B1:C0 FF D0 F8 A0 1E 99 98 17
09B9:DB 88 C0 FF D0 F8 A0 1E BD
09C1:99 C0 DB 88 C0 FF D0 F8 75
09C9:60 8D 17 0A AD 11 D0 10 56
09D1:FB AC 17 0A A2 00 B9 69 82
09D9:16 9D 20 07 C8 E8 E0 1F 9D
09E1:D0 F4 AC 17 0A A2 00 B9 35
09E9:68 17 9D 48 07 C8 E8 E0 3C
09F1:1F D0 F4 AC 17 0A A2 00 57
09F9:B9 67 18 9D 70 07 C8 E8 B9
0A01:E0 1F D0 F4 AC 17 0A A2 2F
0A09:00 B9 66 19 9D 98 07 C8 10
0A11:E8 E0 1F D0 F4 60 DA 8D 2F
0A19:30 0A CE 30 0A AD 30 0A 16
0A21:C9 FF F0 0A A0 FF 88 C0 AF
0A29:FF D0 FB 4C 1B 0A 60 FF 77
0A31:AD 00 DC C9 7E F0 2F C9 34
0A39:76 F0 31 C9 77 F0 36 C9 3D
0A41:75 F0 38 C9 7D F0 3D C9 E3
0A49:79 F0 3F C9 7B F0 44 C9 CC
0A51:7A F0 46 C9 7F D0 01 60 E5
0A59:8D 52 0B 20 1E 0B AD 52 F6
0A61:0B 69 0F 4C 34 0A 20 A3 A9
0A69:0A 4C 58 0A 20 A3 0A 20 05
0A71:C8 0A 4C 58 0A 20 C8 0A E7
0A79:4C 58 0A 20 C1 0A 20 C8 4C
0A81:0A 4C 58 0A 20 C1 0A 4C C1
0A89:58 0A 20 C1 0A 20 B0 0A A8
0A91:4C 58 0A 20 B0 0A 4C 58 C3
0A99:0A 20 A3 0A 20 B0 0A 4C F3
0AA1:58 0A AD 01 D0 E9 02 C9 26
0AA9:3A 90 03 8D 01 D0 60 AD F1
0AB1:15 09 C9 01 F0 03 20 D8 88
0AB9:0A A9 01 8D 15 09 60 60 24
0AC1:EE 01 D0 EE 01 D0 60 AD 50
0AC9:15 09 C9 01 D0 03 20 FB C2
0AD1:0A A9 02 8D 15 09 60 A9 A5
0AD9:00 8D EE 0A 20 EF 0A EE 93
0AE1:EE 0A AD EE 0A C9 03 D0 E2
0AE9:F3 EE F8 07 60 00 EE F8 1D
0AF1:07 20 93 0B A9 23 20 18 E6
0AF9:0A 60 A9 04 8D 11 0B 20 87
0B01:12 0B CE 11 0B AD 11 0B 0A
0B09:C9 01 D0 F3 CE F8 07 60 66
0B11:00 CE F8 07 20 9D 0B A9 A1
0B19:23 20 18 0A 60 AD 51 0B D3
0B21:C9 00 F0 01 60 20 FE 13 DE
0B29:78 AD 15 09 8D 51 0B C9 AB
0B31:01 F0 08 A9 A0 8D 02 D0 AF
0B39:4C 41 0B A9 6E 8D 02 D0 40
0B41:AD 01 D0 8D 03 D0 AD 15 2D
0B49:D0 09 02 8D 15 D0 58 60 20
0B51:00 00 AD 51 0B C9 00 F0 A2
0B59:24 AD 11 D0 10 FB AD 51 39
0B61:0B C9 01 F0 0C AD 02 D0 8A
0B69:18 69 10 B0 10 8D 02 D0 7E
0B71:60 AD 02 D0 38 E9 10 90 8A
0B79:04 8D 02 D0 60 AD 15 D0 F6
0B81:29 FD 8D 15 D0 A9 00 8D 69
0B89:51 0B 60 AD 15 09 C9 01 53
0B91:F0 0A EE 16 09 AD 16 09 16
0B99:20 CA 09 60 CE 16 09 AD 28
0BA1:16 09 20 CA 09 60 AD 1E F8
0BA9:D0 8D 9B 0C AD 1F D0 8D D8
0BB1:9C 0C AD 18 09 C9 01 F0 B2
0BB9:18 AD 9C 0C 29 01 C9 01 7D
0BC1:D0 03 4C 65 0C AD 9B 0C 3B
0BC9:29 01 C9 01 D0 03 4C 65 8E
0BD1:0C AD 9B 0C 29 04 C9 04 7E
0BD9:D0 17 AD A3 0C C9 FF F0 86
0BE1:06 20 27 14 20 CB 11 A9 25
0BE9:FF 8D A3 0C A9 09 8D 29 4E
0BF1:D0 AD 11 0E C9 01 F0 20 33
0BF9:AD 9B 0C 29 08 C9 08 D0 2A
0C01:17 AD A4 0C C9 FF F0 06 9B
0C09:20 27 14 20 CB 11 A9 FF 75
0C11:8D A4 0C A9 09 8D 2A D0 D8
0C19:AD 9B 0C 29 10 C9 10 D0 9B
0C21:17 AD A5 0C C9 FF F0 06 DB
```

```
0C29:20 27 14 20 CB 11 A9 FF 95
0C31:8D A5 0C A9 09 8D 2B D0 3B
0C39:AD 9B 0C 29 20 C9 20 D0 5C
0C41:22 20 50 14 EE C9 10 AD 2A
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1A19:41 41 41 41 41 41 41 41 4D
1A21:41 55 56 42 42 42 42 42 1C
1A29:42 42 42 42 42 42 42 42 5D
1A31:42 42 55 5D 5D 52 53 53 C5
1A39:53 53 53 53 53 54 5D 5D 8F
1A41:56 47 47 47 47 47 47 47 FC
1A49:47 47 47 47 47 47 47 47 7D
1A51:47 47 47 47 47 47 47 47 85
1A59:47 47 47 47 47 47 47 47 8D
1A61:47 47 47 47 00 3E 3F 3F 1F
1A69:40 41 42 43 44 45 47 48 98
1A71:49 4B 4C 4E 50 51 53 55 4F
1A79:57 59 5A 5C 5E 60 63 65 61
1A81:67 69 6B 6D 6F 72 74 76 AC
1A89:78 7B 7D 7F 81 83 85 88 2E
1A91:8A 8C 8E 90 92 94 96 98 B5
1A99:9A 9B 9D 9F A1 A2 A4 A5 36
1AA1:A7 A8 A9 AA AC AD AE AF DC
1AA9:AF B0 B1 B1 B2 B2 B3 B3 AE
1AB1:B3 B3 B3 B3 B3 B3 B3 B2 E4
1AB9:B2 B2 B1 B0 AF AF AE AD 7C
1AC1:AC AB A9 A8 A7 A5 A4 A2 B6
1AC9:A1 9F 9D 9C 9A 98 96 94 2D
1AD1:92 90 8E 8C 8A 88 86 84 16
1AD9:81 7F 7D 7B 79 76 74 72 17
1AE1:70 6D 6B 69 67 65 63 61 A6
1AE9:5F 5D 5B 59 57 55 53 51 2E
1AF1:50 4E 4D 4B 4A 48 47 46 88
1AF9:44 43 42 41 40 3F 3F 3E 39
1B01:3D 3D 3C 3C 3C 3C 3C 3C F7
1B09:3C 3C 3C 3C 3D 3D 3E 3E 51
1B11:3F 40 41 41 42 44 45 46 27
1B19:47 49 4A 4B 4D 4F 50 52 DD
1B21:54 55 57 59 5B 5D 5F 61 C7
1B29:63 65 67 6A 6C 6E 70 72 6E
1B31:75 77 79 7B 7E 80 82 84 66
1B39:86 88 8B 8D 8F 91 93 95 9E
1B41:97 98 9A 9C 9E A0 A1 A3 E4
1B49:A4 A6 A7 A8 AA AB AC AD 06
1B51:AE AF B0 B0 B1 B2 B2 B3 5D
1B59:B3 B3 B3 B3 B3 B3 B3 B3 8F
1B61:B3 B2 B2 B1 B1 65 66 66 E5
1B69:66 66 66 66 66 67 68 20 61
1B71:20 20 20 20 20 20 68 68 80
1B79:13 03 0F 12 05 3A 20 68 B6
1B81:68 20 30 30 30 30 20 20 9F
1B89:68 68 20 20 20 20 20 20 F5
1B91:20 68 68 13 08 09 10 13 C7
1B99:3A 20 68 68 20 20 20 20 6A
1BA1:20 20 20 68 68 20 20 20 9E
1BA9:20 20 20 20 68 68 20 20 43
1BB1:20 20 20 20 20 68 68 20 99
1BB9:20 20 20 20 20 20 68 68 C8
1BC1:20 20 20 20 20 20 20 20 68 40
1BC9:68 20 20 20 20 20 20 20 24
1BD1:68 68 20 20 20 20 20 20 3E
1BD9:20 68 68 20 20 20 20 20 2B
1BE1:20 20 68 68 20 20 20 20 A5
1BE9:20 20 20 68 68 20 20 20 E6
1BF1:20 20 20 20 68 68 13 05 56
1BF9:03 14 0F 12 3A 68 68 20 1E
1C01:20 20 20 20 20 20 68 68 12
1C09:20 65 66 66 66 67 20 68 57
1C11:68 20 68 6F 6F 6F 68 20 B3
```

```
1C19:68 68 20 69 66 66 66 6A 3E
1C21:20 68 68 20 20 20 20 20 74
1C29:20 20 68 68 20 20 20 20 EE
1C31:6B 6C 20 68 68 20 20 20 E8
1C39:20 20 20 20 68 69 66 66 AB
1C41:66 66 66 66 66 6A 03 03 5F
1C49:03 03 03 03 03 03 03 03 81
1C51:05 05 05 05 05 05 05 03 87
1C59:03 01 01 01 01 01 01 05 96
1C61:03 03 05 05 05 05 05 05 18
1C69:05 03 03 05 05 05 05 05 E0
1C71:05 05 03 03 01 01 01 01 0D
1C79:01 01 05 03 03 05 05 05 7E
1C81:05 05 05 05 03 03 05 05 A1
1C89:05 05 05 05 05 03 03 05 B5
1C91:05 05 05 05 05 05 03 03 C3
1C99:05 05 05 05 05 05 05 03 CF
1CA1:03 05 05 05 05 05 05 05 D8
1CA9:03 03 05 05 05 05 05 05 60
1CB1:05 03 03 05 05 05 05 05 29
1CB9:05 05 03 03 05 05 05 05 91
1CC1:05 05 05 03 03 05 05 05 C9
1CC9:05 05 05 05 03 03 05 05 E9
1CD1:05 05 05 05 05 03 03 01 F9
1CD9:01 01 01 01 01 01 03 03 18
1CE1:05 05 05 05 05 05 05 03 18
1CE9:03 05 01 01 01 01 01 05 28
1CF1:03 03 05 01 06 06 06 01 72
1CF9:05 03 03 05 01 01 01 01 35
1D01:01 05 03 03 05 05 05 05 D8
1D09:05 05 05 03 03 05 05 05 13
1D11:05 01 01 05 03 03 05 05 B1
1D19:05 05 05 05 05 03 03 03 45
1D21:03 03 03 03 03 03 03 38 90
1D29:67 C6 C0 C6 67 38 00 1B 84
1D31:1B 33 33 6F 63 63 00 6C 38
1D39:63 63 6C 63 63 6C 00 1E AC
1D41:33 60 60 60 33 1E 00 6C BD
1D49:66 63 63 63 66 6C 00 6F 86
1D51:60 60 6C 60 60 6F 00 6F 97
1D59:60 60 6C 60 60 60 00 1E 12
1D61:30 60 67 60 33 1E 00 63 34
1D69:63 63 6F 63 63 63 00 3F 3A
1D71:0C 0C 0C 0C 0C 3F 00 3F 93
1D79:06 06 06 06 36 1C 00 63 DE
1D81:66 6C 68 6C 66 63 00 60 FE
1D89:60 60 60 60 60 6F 00 63 42
1D91:6F 6B 63 63 63 63 00 63 0D
1D99:6B 6F 67 63 63 63 00 1C 4D
1DA1:36 63 63 63 36 1C 00 6E 03
1DA9:63 63 63 6E 60 60 00 1C 62
1DB1:36 63 63 67 36 1F 00 6E 5F
1DB9:63 63 6E 63 63 63 00 3E 69
1DC1:63 60 3E 03 63 3E 00 7F 51
1DC9:0C 0C 0C 0C 0C 0C 00 63 43
1DD1:63 63 63 63 63 2E 00 63 70
1DD9:63 63 36 36 36 1C 00 63 4E
1DE1:63 63 63 6B 6F 67 00 63 46
1DE9:63 36 1C 36 63 63 00 63 56
1DF1:63 63 3F 03 03 3E 00 7F 5F
1DF9:03 06 0C 18 30 7F 00 3C F5
1E01:30 30 30 30 30 3C 00 0C E8
1E09:12 30 7C 30 62 FC 00 3C 30
1E11:0C 0C 0C 0C 0C 3C 00 00 E9
1E19:18 3C 7E 18 18 18 18 00 13
1E21:10 30 7F 7F 30 10 00 00 1B
1E29:00 00 00 00 00 00 00 18 7D
1E31:18 18 18 00 00 18 00 66 49
1E39:66 46 00 00 00 00 00 66 A0
1E41:66 FF 66 FF 66 66 00 18 62
1E49:3E 60 3C 06 7C 18 00 62 4B
1E51:66 0C 18 30 66 46 00 3C 52
1E59:66 3C 38 67 66 3F 00 06 8B
1E61:0C 18 00 00 00 00 00 0C B5
1E69:18 30 30 30 18 0C 00 30 E7
1E71:18 0C 0C 0C 18 30 00 00 80
1E79:66 3C FF 3C 66 00 00 00 EE
1E81:18 18 7E 18 18 00 00 00 E1
1E89:00 00 00 00 18 18 30 00 47
1E91:00 00 7E 00 00 00 00 00 9D
1E99:00 00 00 00 18 18 00 00 F6
1EA1:03 06 0C 18 30 60 00 7C 63
1EA9:C6 CE D6 E6 C6 7C 00 18 86
1EB1:38 78 18 18 18 FE 00 7C E5
1EB9:C6 06 0C 30 C0 FE 00 FE 60
1EC1:06 0C 3C 06 C6 7C 00 C0 D4
1EC9:C0 CC CC DE 0C 0C 00 FE B0
1ED1:C0 FC 06 06 C6 7C 00 3C 33
1ED9:66 C0 FC C6 C6 7C 00 FE AC
1EE1:06 0C 18 30 30 30 00 7C E8
1EE9:C6 C6 7C C6 C6 7C 00 7C DB
1EF1:C6 C6 7E 06 C6 7C 00 00 9B
1EF9:00 18 00 00 18 00 00 00 FC
1F01:00 18 00 00 18 18 30 0E D4
1F09:18 30 60 30 18 0E 00 00 67
1F11:00 7E 00 7E 00 00 00 70 47
1F19:18 0C 06 0C 18 70 00 7C E6
1F21:C6 06 1C 18 00 18 00 AA 54
1F29:AA AA AA AA AA AA AA FF BC
1F31:FF FF EE BB AA AB BA A9 2C
1F39:9A AA 66 99 55 55 55 81 02
1F41:3C 34 34 34 34 34 34 34 83
1F49:34 34 E9 E9 A6 BA E9 00 7E
1F51:00 00 00 03 0F 3F FE 00 33
1F59:00 00 00 40 50 54 95 FF 9A
1F61:AA AA 55 20 20 08 08 C0 3E
1F69:F0 FF EE BB AA AB BA 03 36
1F71:0F FF EE BB AA AB BA 02 4C
1F79:0C 30 33 33 C0 CC C0 80 9E
1F81:10 04 04 04 01 01 01 FA 92
1F89:3E 0E 0E 0E 0E 0E 0E A5 77
1F91:94 90 90 90 90 90 90 FF 41
1F99:FD E9 E9 E9 E9 D5 55 03 81
1FA1:0F 0F 2E 3B 2A AB BA 00 1A
1FA9:00 00 00 00 00 11 44 00 B4
1FB1:55 A9 A9 A9 A9 A9 A9 FF 1C
1FB9:FF EA EA EA EA EA EA FF 97
1FC1:FF AA AA AA AA AA AA FF FF
1FC9:FD A9 A9 A9 A9 A9 A9 EA 73
1FD1:EA EA EA EA EA EA EA A9 CE
1FD9:A9 A9 A9 A9 A9 A9 A9 EA 59
1FE1:EA EA EA EA EA D5 55 AA 60
1FE9:AA AA AA AA AA 55 55 A9 27
1FF1:A9 A9 A9 A9 A9 55 55 0E 9A
1FF9:0E 3A 39 39 E4 E4 E4 00 0D
2001:00 00 00 01 04 10 40 01 33
2009:04 10 40 00 00 00 00 20 77
2011:20 20 AA 20 20 20 20 20 A2
2019:20 20 AA 20 20 20 AA 00 9F
2021:FF BB EE 99 66 55 00 F9 4A
2029:E5 F9 E5 F9 E5 F9 E5 00 1A
2031:0F 3F 3E F9 E6 F9 E5 00 1B
2039:F0 B4 E4 95 A5 99 E5 00 74
2041:AF 6B 9E 49 16 05 00 AA 0C
2049:00 00 00 00 00 00 00 3F C8
2051:7F E0 C0 C0 C0 C3 C3 FF 4A
2059:FF 00 00 00 00 FF FF FC 96
2061:FE 07 03 03 03 C3 C3 C3 E5
2069:C3 C3 C3 C3 C3 C3 C3 C3 A9
2071:C3 C0 C0 C0 E0 7F 3F C3 2F
2079:C3 03 03 03 07 FE FC FC 18
2081:06 06 FC C6 C6 C6 FC 1C B9
2089:30 30 60 60 60 70 3F C0 04
2091:E0 F0 7F 7E 3F 7F FC 00 48
2099:00 00 E0 10 FF C0 00 FF F9
20A1:FF FF FF FF FF FF FF 00 E1
20A9:00 00 00 00 00 E0 00 00 6D
20B1:A0 00 00 A8 00 00 AA 00 22
20B9:00 3E FC 00 AA 83 00 FF 8C
20C1:A0 C0 55 6A A0 2A 85 55 E1
20C9:2A 80 00 3F 00 00 2A 00 87
20D1:00 55 50 00 00 00 00 00 71
20D9:00 00 00 00 00 00 00 00 1A
20E1:00 00 00 00 00 00 79 55 6A
20E9:50 00 2A 00 00 2A 00 00 40
20F1:2A 00 00 3F 00 00 2A 80 10
20F9:00 2A 80 00 15 50 00 59 18
2101:BF 80 66 C0 A0 F9 C0 E5 70
2109:66 C0 A0 59 BF 80 15 50 D2
2111:00 2A 80 00 2A 80 00 3F 80
2119:00 00 2A 00 00 2A 00 00 49
2121:2A 00 00 55 50 00 FF 00 50
2129:04 00 00 0C 00 00 30 00 8E
2131:00 30 00 00 30 00 00 C0 C1
2139:00 00 EC 00 00 E0 00 02 9E
2141:B0 00 08 20 00 3C 24 00 18
2149:08 20 00 02 B0 00 00 E0 1E
2151:00 00 EC 00 00 C0 00 00 34
2159:30 00 00 30 00 00 30 00 17
2161:00 0C 00 00 04 00 FF 00 C6
2169:05 55 00 00 54 00 00 54 7A
2171:00 00 54 00 00 FC 00 01 33
2179:54 00 01 54 00 05 74 01 49
2181:55 55 05 55 55 57 F5 D5 83
2189:05 55 55 01 55 55 00 05 63
2191:74 00 01 54 00 01 54 00 20
2199:00 FC 00 00 54 00 00 54 12
21A1:00 00 54 00 05 55 00 00 EB
21A9:00 00 00 00 00 00 00 0B F6
21B1:00 00 0A 00 00 2A 00 00 DD
21B9:AA 00 3F BC 00 C2 AA 03 68
21C1:0A FF 0A A9 55 55 52 A8 32
21C9:00 02 A8 00 00 FC 00 00 95
21D1:A8 00 05 55 00 00 00 00 5E
21D9:00 00 00 00 00 00 00 00 1C
21E1:00 00 00 00 00 00 00 00 24
21E9:00 00 00 00 00 00 00 00 2C
21F1:00 00 00 00 00 00 00 00 34
21F9:00 00 00 00 00 00 00 00 3C
2201:00 00 00 00 00 00 8A AA A2 67
2209:00 00 00 00 00 00 00 00 4D
2211:00 00 00 00 00 00 00 00 55
2219:00 00 00 00 00 00 00 00 5D
2221:00 00 00 00 00 00 FF 00 65
2229:00 00 00 00 00 00 00 00 6D
2231:00 00 00 00 00 00 03 C3 3F
2239:40 03 FF 40 0F FD 50 0F 82
2241:E9 50 0B 96 60 02 6B 40 7B
2249:02 6B 40 0B BE 60 0F E9 A1
2251:50 0F D5 50 03 55 40 03 32
2259:41 40 00 00 00 00 00 00 4E
2261:00 00 00 00 00 00 FF 00 A5
2269:00 00 00 00 00 00 00 00 AD
2271:00 00 00 00 00 00 00 00 B5
2279:00 00 00 00 03 C0 00 0E E6
2281:BC 00 0E A3 00 03 2B 00 82
2289:03 8C 00 00 F0 00 00 00 F9
2291:00 00 00 00 00 00 00 00 D5
2299:00 00 00 00 00 00 00 00 DD
22A1:00 00 00 00 00 00 00 00 E5
22A9:00 00 00 00 00 00 00 00 ED
22B1:00 00 00 00 00 C0 0F 03 1A
22B9:30 0E C3 B0 0E FE B0 0E F8
22C1:AA C0 03 2A 00 03 AB 00 F1
22C9:03 8A C0 03 BC B0 0E C3 03
22D1:AC 0E C0 F0 0C C0 C0 03 FE
22D9:00 00 00 00 00 00 00 00 1E
22E1:00 00 00 00 00 00 FF 00 26
22E9:00 00 00 00 3C 3C 00 EB EC
22F1:EB 03 AB EB 03 AB EB 00 BF
22F9:EC E2 C0 EC 3A FF AC 0E 8D
2301:AA B0 0E 2A C0 0E AB 00 C2
2309:0E 8A C0 0E A8 B0 3A BE 2D
2311:AC 3A C3 AC E8 C3 8C E2 D1
2319:C3 AB EB 00 EB EB 00 3B F3
2321:3C 00 0C 00 00 00 71 00 E9
2329:00 00 00 00 3C 3C 00 EB 2E
2331:EB 03 AB EB 03 AB EB 00 01
2339:EC E3 00 FC 3C 3C 00 03 94
2341:EB 00 0E 2A C0 0E A8 C0 32
2349:0E 8A C0 03 AB 00 30 FC 3C
2351:FC 3C 00 EC EB C3 8C E2 5E
2359:C3 AB EB 00 EB EB 00 3B 34
2361:3C 00 0C 00 00 00 71 00 2A
2369:00 00 00 00 00 00 00 3C EB
2371:3C 00 EC EC 00 EC 30 00 56
2379:30 00 00 00 00 00 00 00 D7
2381:F0 00 03 2F 00 03 AB 00 F6
2389:03 8B 00 00 FC 00 00 00 1C
2391:00 00 00 30 3C 00 CC 33 89
2399:00 EC EC 00 3C 3C 00 0C 97
23A1:00 00 00 00 00 00 00 00 E7
23A9:00 00 00 00 00 00 00 0C FB
23B1:30 00 20 00 00 CC 30 00 A7
23B9:00 00 00 00 00 00 00 00 FF
23C1:00 00 03 23 00 00 00 00 9A
23C9:03 08 00 00 30 00 00 00 15
23D1:00 00 00 00 00 0C 00 CC 03 15
23D9:00 00 C0 00 30 0C 00 0C F5
23E1:00 00 00 00 00 00 FF 00 28
23E9:00 00 00 00 00 00 00 00 30
23F1:00 00 00 00 00 00 00 00 38
23F9:C0 00 03 C0 00 3E FF 03 09
2401:FB BB 3E EE EA FB AA AA 34
2409:D9 AA AE 16 66 BF 01 59 AD
```

```
2411:83 00 16 40 00 01 40 00 66
2419:00 40 00 00 00 00 00 00 71
2421:00 00 00 00 00 00 00 00 69
2429:FF FC 03 EA A4 00 15 A4 B3
2431:00 0F A4 0E EA A8 3B BB DE
2439:B8 EE EE EC BF FF F4 EE 1D
2441:AA 94 A5 55 54 A9 99 94 1F
2449:EE 66 50 FF F5 50 BB B5 CA
2451:40 EA A4 00 3A A9 00 0E 8F
2459:A9 00 03 AA 40 FF FF 40 C3
2461:00 00 00 00 00 00 00 00 A9
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Programmer's Page

Article on page 51.

Program 1: 1571 Drive Check

```
XB 100 DN=8:CLOSE 1:OPEN 1,DN,
       15,"U9":INPUT#1,EN,EM$,
       ET,ES
HM 110 IF RIGHT$(EM$,2)<>"71"
       {SPACE}THEN PRINT:PRINT
        "NOT A 1571 DRIVE":CLO
       SE 1:END
AQ 120 PRINT#1,"M-R"CHR$(0)CHR
       $(128)CHR$(2):GET#1,A$,
       B$:CLOSE 1
ES 130 A=ASC(A$+CHR$(0)):B=ASC
       (B$+CHR$(0)):R$="UNKNOW
       N"
KK 140 IF A=157 THEN IF B=30 T
       HEN R$="-01"
KR 150 IF A=146 THEN IF B=37 T
       HEN R$="-03"
GK 160 IF A=242 THEN IF B=104
       {SPACE}THEN R$="-05"
FE 170 PRINT "1571 DOS ROM REV
       ISION IS ";R$
```

Program 2: CBM Drive Check

```
JH 100 INPUT "CHECK WHICH UNIT
       ";U:OPEN 8,U,15
EG 110 PRINT#8,"M-R"CHR$(0)CHR
       $(192)CHRR$(2):GET#8,A$
       ,B$
GD 120 PRINT#8,"M-R"CHR$(47)CH
       R$(255)CHR$(1):GET#8,C$
QH 130 CLOSE 8
MK 140 A=ASC(A$+CHR$(0)):B=ASC
       (B$+CHR$(0)):C=ASC(C$+C
       HR$(0))
PQ 150 IF A<>151 THEN 200
BJ 160 IF C<>169 THEN PRINT "1
       541":END
SB 170 IF B=70 THEN PRINT "154
       1B WITH UPDATE":ND
GB 180 IF B=170 THEN PRINT "15
       41B THAT NEEDS UPDATE":
       END
PX 190 IF B=224 THEN PRINT "15
       41-II":END
BG 200 IF A=56 THEN PRINT "157
       1 WITH UPDATE":END
PM 210 IF A=66 THEN PRINT "157
       1 THAT NEEDS UPDATE":EN
       D
QK 220 IF A=132 THEN PRINT "15
       71CR":END
XK 230 IF A=192 THEN PRINT "15
       81":END
CR 240 PRINT "UNRECOGNIZED DRI
       VE"
```

CHR$ Graphics

See instructions in article on page 30 before typing in.

Program 1: CHR$ Graphics

```
7C00:A9 D8 8D 01 40 20 8B 7E DD
7C08:A9 EC 8D 04 03 A9 7C 8D 48
7C10:05 03 A9 AC 8D 06 03 A9 80
7C18:7D 8D 07 03 A9 11 8D 08 F8
7C20:03 A9 7E 8D 09 03 A2 00 47
7C28:8A 9D C0 36 9D 00 37 E8 8D
7C30:D0 F7 20 B2 7C D0 15 AD BD
7C38:54 7C 29 C0 18 69 40 8D 20
7C40:54 7C 90 03 EE 55 7C 20 AA
7C48:B2 7C F0 24 85 26 A2 02 26
7C50:BD 30 81 8D C0 36 EE 54 4E
7C58:7C CA 10 F4 C6 26 D0 EE F2
7C60:AD 51 7C 18 69 03 8D 51 59
7C68:7C 90 C7 EE 52 7C D0 C2 94
7C70:A2 00 8A 20 A2 8A E8 D0 EF
7C78:F9 20 13 8C A9 00 85 B2 AC
7C80:85 05 85 06 A9 09 8D 02 1D
7C88:40 A9 05 8D 03 40 A9 BE B0
7C90:8D 18 03 A9 7C 8D 19 03 A0
7C98:A9 01 8D 86 02 8D 20 D0 18
7CA0:20 7F 7E A9 1D 8D 18 D0 14
7CA8:A9 0E 20 16 E7 A9 08 4C A1
7CB0:16 E7 EE BB 7C D0 03 EE 64
7CB8:BC 7C AD 16 81 60 48 8A EE
7CC0:48 98 48 A9 7F 8D 0D DD D1
7CC8:AC 0D DD 30 1C 20 02 FD 7D
7CD0:F0 14 20 BC F6 20 E1 FF 13
7CD8:D0 0F 20 A3 FD 20 18 E5 C2
7CE0:20 8E 7C 6C 02 A0 4C 5B 6A
7CE8:FE 4C 72 FE A6 7A A0 04 17
7CF0:84 0F BD 00 02 10 07 C9 CF
7CF8:FF F0 3E E8 D0 F4 C9 20 92
7D00:F0 37 85 08 C9 22 F0 56 81
7D08:24 0F 70 2D C9 3F D0 04 AA
7D10:A9 99 D0 25 C9 30 90 04 E6
7D18:C9 3C 90 1D 84 71 A0 00 16
7D20:84 0B 88 86 7A CA C8 E8 13
7D28:BD 00 02 38 F9 9E A0 F0 42
7D30:F5 C9 80 D0 30 05 0B A4 06
7D38:71 E8 C8 99 FB 01 B9 FB 2C
7D40:01 F0 38 38 E9 3A F0 04 A0
7D48:C9 49 D0 02 85 0F 38 E9 77
7D50:55 D0 9F 85 08 BD 00 02 AF
7D58:F0 DF C5 08 F0 DB C8 99 1F
7D60:FB 01 E8 D0 F0 A6 7A E6 C1
7D68:0B C8 B9 9D A0 10 FA B9 21
7D70:9E A0 D0 B4 F0 0F BD 00 87
7D78:02 10 BC 99 FD 01 C6 7B A6
7D80:A9 FF 85 7A 60 A0 FF CA F8
7D88:C8 E8 BD 00 02 38 F9 E1 A0
7D90:7D F0 F5 C9 80 D0 04 05 36
7D98:0B D0 9C A6 7A E6 0B C8 99
7DA0:B9 E0 7D 10 FA B9 E1 7D 61
7DA8:D0 E0 F0 CA 30 03 4C F3 29
7DB0:A6 C9 FF F0 F9 24 0F 30 2F
7DB8:F5 C9 CC B0 03 4C 24 A7 FE
7DC0:38 E9 CB AA 84 49 A0 FF 01
7DC8:CA F0 08 C8 B9 E1 7D 10 53
7DD0:FA 30 F5 C8 B9 E1 7D 30 21
7DD8:05 20 47 AB D0 F5 4C EF E8
7DE0:A6 44 4C 4F 41 C4 43 4C AE
7DE8:4F 41 C4 44 53 41 56 C5 CA
7DF0:43 53 41 56 C5 45 44 49 05
7DF8:54 4F D2 53 54 41 4D D0 94
7E00:45 52 41 53 C5 43 4C 45 AA
7E08:41 D2 4D 55 4C 54 49 C3 63
7E10:00 20 73 00 20 1A 7E 4C 36
7E18:AE A7 C9 CC 90 14 C9 D5 9A
7E20:B0 10 38 E9 CC 0A A8 B9 B8
7E28:39 7E 48 B9 38 7E 48 4C 9E
7E30:73 00 20 79 00 4C ED A7 37
7E38:5F 7E 5C 7E 9C 7E 99 7E 88
7E40:68 81 EA 7E ED 7E 08 8C 1D
7E48:49 7E 20 DF 7E 8D 22 D0 CA
7E50:8D 02 40 20 DC 7E 8D 23 BD
7E58:D0 8D 03 40 60 A2 01 2C 41
7E60:A2 08 A0 01 20 BA FF 20 E0
7E68:CE 7E A9 00 A2 00 A0 38 30
7E70:20 D5 FF B0 22 86 02 84 B1
7E78:03 20 7F 7E 4C 97 84 AD 4E
7E80:02 40 8D 22 D0 AD 03 40 E5
7E88:8D 23 D0 AD 01 40 8D 16 44
7E90:D0 29 10 4A 85 04 60 4C 30
7E98:D1 E1 A2 01 2C A2 08 A0 F7
7EA0:01 20 BA FF 20 CE 7E AD 64
7EA8:16 D0 8D 01 40 AD 22 D0 74
7EB0:8D 02 40 AD 23 D0 8D 03 52
7EB8:40 AD 00 40 20 B1 88 A9 C7
7EC0:57 A6 02 A4 03 20 D8 FF E7
7EC8:B0 01 60 4C F9 E0 A9 00 D5
7ED0:20 BD FF 20 06 E2 20 57 A2
7ED8:E2 4C BD FF 20 FD AE 20 88
7EE0:9E AD 20 8D AD 20 BF B1 94
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8CE8:78 A5 03 8D 68 8D E9 7A A8
8CF0:B0 DA A2 FF E8 20 72 8D A7
8CF8:F0 FA 86 B6 A0 0E 88 20 F3
8D00:80 8D F0 FA C8 98 85 F7 38
8D08:38 E5 B5 85 B3 A2 0E CA D6
8D10:20 72 8D F0 FA E8 8A 85 AE
8D18:F8 38 E5 B6 85 B4 A2 00 2A
8D20:B5 B2 20 66 8D E8 E0 05 04
8D28:D0 F6 A9 00 8D 51 8D 20 8B
8D30:45 8D A9 D4 8D 51 8D 20 C0
8D38:45 8D AD 67 8D 85 02 AD B9
8D40:68 8D 85 03 60 A6 B6 BD 9C
8D48:8E 8D 85 35 BD 9C 8D 18 A5
8D50:69 00 85 36 A4 B5 B1 35 C8
8D58:20 66 8D C8 C4 F7 D0 F6 F9
8D60:E8 E4 F8 D0 E2 60 8D 04 0D
8D68:40 EE 67 8D D0 03 EE 68 FD
8D70:8D 60 A0 0D 20 6D 86 C9 DC
8D78:00 D0 04 88 10 F6 C8 60 1F
8D80:A2 0D 20 6D 86 C9 00 D0 37
8D88:04 CA 10 F6 E8 60 91 B9 6F
8D90:E1 09 31 59 81 A9 D1 F9 EA
8D98:21 49 71 99 05 05 05 06 AA
8DA0:06 06 06 06 06 06 07 07 BE
8DA8:07 07 20 7E 8F A9 00 85 9D
8DB0:35 85 9E A0 6F A9 92 85 72
8DB8:36 A9 9F 85 9F A2 06 B1 EA
8DC0:35 48 B1 9E 20 09 8E 91 7C
8DC8:35 68 20 09 8E 91 9E E6 0C
8DD0:36 C6 9F CA 10 E9 88 10 A2
8DD8:DC 20 BC 8F A2 0D A0 06 8B
8DE0:20 77 86 8D F7 8D 8C FC 9F
8DE8:8D A9 0D 38 ED FC 8D A8 81
8DF0:20 77 86 8D FE 8D A9 00 25
8DF8:20 8B 86 A0 00 A9 00 20 A8
8E00:8B 86 88 10 DB CA 10 D6 97
8E08:60 85 26 A5 04 F0 10 A5 7F
8E10:26 29 55 0A 85 27 A5 26 10
8E18:29 AA 4A 05 27 85 26 86 30
8E20:28 A2 07 06 26 66 27 CA 1F
8E28:10 F9 A6 28 A5 27 60 20 CD
8E30:7E 8F A9 92 85 36 85 9F 7E
8E38:A9 0E 85 26 A0 00 84 35 04
8E40:A9 6F 85 9E A2 37 B1 35 33
8E48:48 B1 9E 91 35 68 91 9E EF
8E50:E6 35 C6 9E CA 10 EF E6 4E
8E58:36 E6 9F C6 26 D0 DF 20 FE
8E60:BC 8F A0 0D A2 06 20 77 89
8E68:86 8D 7D 8E 8E 82 8E A9 0A
8E70:0D 38 ED 82 8E AA 20 77 DE
8E78:86 8D 84 8E A9 00 20 8B CE
8E80:86 A2 00 A9 00 20 8B 86 42
8E88:CA 10 DB 88 10 D6 60 20 CF
8E90:7E 8F A0 0D A9 92 8D 9B 04
8E98:8E AD 00 92 D0 3D EE 9B 86
8EA0:8E 88 10 F5 A9 92 8D B2 ED
8EA8:8E 8D B5 8E A0 00 A2 00 5A
8EB0:BD 01 92 9D 00 92 E8 E0 16
8EB8:6F D0 F5 EE B2 8E EE B5 D2
8EC0:8E C8 C0 0E D0 E8 A9 92 60
8EC8:8D D1 8E A0 0D A9 00 8D 99
8ED0:6F 92 EE D1 8E 88 10 F7 F3
8ED8:4C BC 8F 60 20 7E 8F A0 FD
8EE0:0D A9 92 8D E8 8E AD 6F 66
8EE8:92 D0 F0 EE E8 8E 88 10 33
8EF0:F5 A9 92 8D FF 8E 8D 02 F5
8EF8:8F A0 00 A2 6E BD 00 92 2D
8F00:9D 01 92 CA 10 F7 EE FF 6B
8F08:8E EE 02 8F C8 C0 0E D0 99
8F10:EA A9 92 8D 1C 8F A0 0D A7
8F18:A9 00 8D 00 92 EE 1C 8F D5
8F20:88 10 F7 4C BC 8F 20 7E 2E
8F28:8F 20 38 8F 4C BC 8F 20 AB
8F30:7E 8F 20 58 8F 4C BC 8F B2
8F38:A5 04 F0 03 20 3F 8F A2 39
8F40:6F A9 9F 8D 4B 8F 18 A0 B7
8F48:0D 3E 00 9F CE 4B 8F 88 C2
8F50:10 F7 B0 24 CA 10 EA 60 9A
8F58:A5 04 F0 03 20 5F 8F A2 D9
8F60:6F A9 92 8D 6B 8F 18 A0 37
8F68:0D 7E 00 92 EE 6B 8F 88 A3
8F70:10 F7 B0 04 CA 10 EA 60 B8
8F78:A6 FC 9A 4C 09 82 A0 00 D5
8F80:A9 00 8D 9F 8F 98 18 69 98
8F88:92 8D A0 8F A2 00 20 6D 24
8F90:86 D0 02 A9 20 20 B1 88 6F
8F98:84 26 A0 00 B1 57 8D 00 9D
8FA0:92 EE 9F 8F C8 C0 08 D0 DB
8FA8:F3 A4 26 E8 E0 0E D0 DE FD
8FB0:C8 C0 0E D0 CB 60 20 B0 04
8FB8:86 A9 80 2C A9 00 85 F9 AA
8FC0:85 FA A0 00 A9 00 8D D9 B7
8FC8:8F 98 18 69 92 8D DA 8F 7F
8FD0:A2 00 84 FB A0 00 84 27 C6
8FD8:AD 00 92 EE D9 8F 99 3F 8F
8FE0:90 05 27 85 27 C8 C0 08 AC
8FE8:D0 EE A5 27 F0 21 E6 FA 28
8FF0:A5 F9 10 1B AD 00 40 20 23
8FF8:B1 88 A0 07 B9 3F 90 91 15
9000:57 88 10 F8 A4 FB AD 00 F0
9008:40 20 91 86 CE 00 40 A4 87
9010:FB E8 E0 0E D0 BC C8 C0 32
9018:0E D0 A9 A5 F9 30 1F AD 80
9020:00 40 38 E9 3F C5 FA B0 AE
9028:8D 20 EA 89 AD 00 40 38 34
9030:E9 3F C5 FA B0 80 A2 03 4E
9038:20 33 80 4C 78 8F 60 00 CD
```

Program 2: Demo.File1

```
3F90:FF FF FF 00 00 E7 E7 E7 66
3F98:E0 F0 80 00 80 F0 60 70 CC
3FA0:07 0C 0F 0F 0F 07 0E 08 31
3FA8:80 80 00 F0 E0 80 E0 C0 22
3FB0:03 03 03 07 0B 06 0C 0E D8
3FB8:3F CF FF F0 FF 7F 30 38 70
3FC0:F0 10 F0 C0 E0 E0 E0 70 A2
3FC8:0F 0F 0F 03 07 07 0E 08 1D
3FD0:FF F1 FF 3C 7E 7E 38 3C 2A
3FD8:00 F0 90 F0 80 F0 C0 80 7E
3FE0:02 0E 08 0F 0F 0F 04 06 98
3FE8:E0 8F 89 FF FC FF C2 83 DD
3FF0:C7 8D BF FC FF EC C6 C3 83
3FF8:38 38 30 7F 76 30 30 38 AC
4000:F2 C8 F7 F0 00 02 01 00 44
4008:00 20 FA B1 04 01 02 01 34
4010:01 00 F9 F8 64 04 02 02 19
4018:01 00 00 20 FE F1 B9 03 51
4020:02 01 01 00 FC FB F9 F9 C7
4028:04 02 01 00 00 20 F7 F1 AD
4030:07 05 02 01 01 00 F4 F3 AB
4038:27 07 07 02 01 01 00 F6 12
```

```
4040:F5 91 F1 09 02 01 01 00 05
4048:FC FB F8 B8 08 02 01 00 3B
4050:00 20 FD F1 A8 06 02 01 1A
4058:00 00 20 FF A1 01 00 00 ED
```

Program 3: Demo.File2

```
3C10:83 99 99 83 99 99 83 FF 56
3C18:FE FE 7A FA E8 A0 80 00 99
3C20:DF F7 F7 F7 FF FF FF FF 05
3C28:00 80 A0 E8 FA FA 7E DE 03
3C30:FF FF FF F5 FF FF AA A8 06
3C38:A8 AA FF FF FF FF FF FF AF
3C40:BF BF AF AF 2B 0A 02 00 FE
3C48:80 80 00 00 00 00 00 00 21
3C50:A0 A0 A0 A0 A0 A0 A0 A0 C8
3C58:00 00 00 00 00 00 80 80 52
3C60:FE FE FA FA E8 A0 80 00 F1
3C68:00 80 A0 E8 FA FA FE FE 64
3C70:FF FF 7F 5F FF FF AA A8 CC
3C78:A8 AA FF FF 7F 7F FF FF E9
3C80:B5 BD AD AF 2B 0A 02 00 79
3C88:FF FF FF FF FF FF FF F7 F8
3C90:00 02 0A 2B AF AF BF BF F8
3C98:02 02 00 00 00 00 00 00 92
3CA0:0A 0A 0A 0A 0A 0A 0A 0A 19
3CA8:00 80 A0 60 80 00 00 00 5F
3CB0:00 00 00 00 00 80 68 A0 9C
3CB8:00 00 00 00 80 A0 A0 00 F8
3CC0:5A D6 F5 FD AA AA 00 00 BA
3CC8:00 80 A0 E8 FA FE 55 55 D7
3CD0:5A 5A 5A 5A 56 A5 AA 0A A6
3CD8:FF FF FF FF FF FF 5A 5A 60
3CE0:2A AA BF FF FF FF 5F 5F 2F
3CE8:5F 5F 5F 5F 55 A5 AA 0A 6B
3CF0:FF BF AF AF FF FF 5F 5F 68
3CF8:00 02 AA EA FF FF FF FF F5
3D00:0A 0A 0A 0A 29 A5 AA 0A 23
3D08:FA FA FE FF BF AF 2B 0A BB
3D10:08 2A AE AF AF AF EB EB E9
3D18:2B 0A 0A 0A 02 00 00 00 9C
3D20:00 00 0A 2A AF AF AF AF C9
3D28:EB AF BF FF FF FF FF FF 7C
3D30:AF AF BF FF FF FF FF FF 66
3D38:FF FF AA AA FF FF AF AF C1
3D40:00 00 00 00 00 00 0A AA 79
3D48:00 00 40 50 40 00 00 00 D1
3D50:FA FA D5 55 D5 F5 AA A8 9B
3D58:FF FF 5F 5F FF FF FF FE B3
3D60:AA AA 80 00 00 00 00 00 EA
3D68:FF FF FA EA A8 A0 80 00 B9
3D70:80 00 00 00 00 00 00 00 2B
3D78:02 00 00 00 00 00 00 00 F3
3D80:AA AA AB AF AF BF FF FE E6
3D88:AB AA AA EA FF FF FF FE 86
3D90:BF FF FF FF FF FE AA AA E6
3D98:2A 0A 02 00 00 02 0A 0A 11
3DA0:0A 2A AF AF AF AF AF AF E6
3DA8:00 00 00 02 0A 0A 02 00 BF
3DB0:00 00 A0 A8 EA FA FF FF 0D
3DB8:00 00 00 00 A0 A8 FA FA CB
3DC0:FF FF FF FF FF FF FF FF 3B
3DC8:00 00 80 A0 A0 80 00 00 64
3DD0:A0 80 00 00 80 A0 A0 00 83
3DD8:FA 5A 56 55 D5 FE FA E8 11
3DE0:00 00 00 00 80 80 A0 E8 8B
3DE8:FF 5E 5A 5A 56 A5 AA 0A 94
3DF0:FF 5F 5F FF FF FF FF FF 2F
3DF8:00 00 00 AA AA FE FF FF 6F
3E00:FF 5F 5F 5F 55 A5 AA 0A D6
3E08:BF FF FF FF FF FF FF FF 64
3E10:00 00 00 00 02 0A 2B AF CA
3E18:AF 2B 0A 0A 29 A5 AA 0A 58
3E20:FA FF FF FF FF FF FF BF D9
3E28:00 00 00 00 00 80 A0 EA D2
3E30:AF AF AF 2B 2B 0A 0A 02 B0
3E38:00 00 00 00 00 0A 2A AF E0
3E40:F5 FF FF 5F 5F 55 55 55 FD
3E48:00 00 00 00 00 00 00 80 45
3E50:00 00 00 00 A0 A8 FA FE 69
3E58:00 00 00 00 00 02 0A 2B 1C
3E60:A0 A0 80 80 80 80 00 00 73
3E68:D7 D7 FF FF AF AA 0A 00 03
3E70:0A 0A 0A 02 02 02 00 00 ED
3E78:00 00 00 00 00 00 A0 A8 DE
3E80:E8 A0 80 00 00 00 00 00 A9
3E88:FF FF FE FA E8 A0 80 00 5F
3E90:AF AF 2B 0A 02 00 00 00 E6
3E98:00 00 00 00 00 00 02 02 1B
3EA0:0A 0A 0A 02 02 00 00 00 16
3EA8:00 00 00 00 00 02 0A 0A 4B
3EB0:00 02 0A 2B AF BF BF BF 5D
3EB8:A0 A0 A0 A0 A0 A0 80 00 54
3EC0:E8 E8 FA FA EA AA A0 00 3E
3EC8:A8 A0 A0 A0 A0 A0 A0 A0 49
3ED0:FF FF 55 55 55 56 5A 6A 70
3ED8:FA FA FA FE 7E 7E FF FF CE
3EE0:7F 7F FE FE FE FE FA FA B1
3EE8:55 55 5F 5F 5F 5F FF FF BF
3EF0:F5 F5 FF BF BD BD AF AF D5
3EF8:AD AD BF BF B5 B5 FF FF 30
3F00:95 A5 BF BF BF BF AF AF B2
3F08:F5 FF 5F 5F 5F 55 55 55 B3
3F10:00 00 00 00 AA AA FF F5 84
3F18:00 00 02 02 02 02 0A 0A 2D
3F20:2B AF A5 A5 A5 A5 29 2A 6F
3F28:FF FE AA AA 80 00 00 00 6A
3F30:BF FF FF FE AA AA 00 00 7E
3F38:AA AA FF FF AA AA 00 00 B6
3F40:AB AF AA EA FF FF FF FE 83
3F48:00 00 AA AA FF FF AF AF D5
3F50:AA AA 00 00 00 00 00 00 CE
3F58:00 00 00 00 00 00 AA AA D6
3F60:00 00 00 00 80 80 A0 A0 CE
3F68:F5 FF FF FF 5F 5F FF FF 5A
3F70:FF FF F5 F5 55 55 F5 F5 EE
3F78:0A 0A 0A 0A 0A 0A 02 02 DE
3F80:F5 F5 FF FF F5 F5 BF BF 3E
3F88:2F 2B 0A 0A 02 00 00 00 5B
3F90:5F 5F FF FF BF AA 2A 00 93
3F98:FA E8 A0 A0 E8 FA FA FA 11
3FA0:FE FA FA FA FA FE FF FF 40
3FA8:AF BF FF FF BF AF FF FF AB
3FB0:FA FA FA E8 E8 A0 AA AA 23
3FB8:F5 F5 F5 F5 55 55 7A FA BD
3FC0:5A 5A 5A 5A 68 A0 80 00 BA
3FC8:00 00 00 80 A0 A8 AA AA F6
3FD0:0A 0A 0A 2B AF AF BF BF 46
3FD8:55 55 55 55 B5 A5 2B 0A FB
3FE0:A0 A8 FA FE 5F 5F FF FF A1
3FE8:AA AA FF FF 5F 5F FF FF DF
3FF0:2A 0A 0A 0A 02 00 00 00 F8
3FF8:00 00 00 00 00 00 0A 2A B5
4000:82 D8 F7 F0 00 05 07 01 29
4008:00 20 20 20 20 20 20 20 78
4010:20 20 20 D5 D6 FD FC F9 AC
4018:D4 FB EE F7 F8 D3 FA ED 5A
4020:F6 CF EF F0 F4 F5 F3 00 84
4028:D2 F2 D1 D0 CD BD 0D 8D 23
4030:09 0D FD 1D 2D 1D AD 0D 50
4038:BD 0D BD 99 0D 8D 9D 3D 43
4040:09 0D 9D 0D 0D 09 0D 0D C0
4048:0D 2D A9 0D 0D 0D 1D 01 78
4050:05 07 01 00 CB E2 E2 CA AF
4058:C9 E4 E1 C8 DA D7 CE E0 74
4060:DD D9 20 E3 DF DC CC 20 B4
4068:CE DE DB EC 20 20 F1 CD 85
4070:D8 20 00 20 20 20 20 0D 36
4078:4D 6D 9D FD 1D 4D 0D BD 84
4080:1D F9 0D FD 0D CD 8D 0D 57
4088:0D 0D 9D C9 DD 3D 0D AD CE
4090:09 AD 0D 8D 9D 99 9D 2D 37
4098:9D B9 02 06 03 01 02 C7 DE
40A0:C5 C2 BF BC 20 C6 C4 C1 DF
40A8:BE BB B9 00 C3 C0 BD BA 06
40B0:00 4E AE 0E EE 1E 0D CE 54
40B8:1E 0E 0E 0E 1D 0E 0E 0E B9
40C0:9E 0E DE 03 06 03 01 02 60
40C8:A4 A2 9F 9C 99 96 A3 A1 12
40D0:9E 9B 98 95 00 A0 9D 9A 4C
40D8:97 00 0E 0E 9E 0E FE 0E 01
40E0:0E CE 1E 3E 8E AD 0E 0E 19
40E8:DE 0E 0E FD 04 05 03 02 3A
40F0:01 D3 92 8F 8D 8B 94 91 87
40F8:B8 B8 8A 93 90 8E 8C 89 EF
4100:0A FA 0A 2A 0A 0A 0A FA B1
4108:2A DA 0A 8A 1A 0A 0A 05 52
4110:05 03 02 01 D3 92 87 85 A3
4118:8B 94 B8 B8 84 8A 93 88 26
4120:86 83 89 0A 9A 0A 9A FA C5
4128:AA 0A 0A 9A 0A 0A 0A 0A 04
4130:CA 0A 06 07 04 01 00 B5 A5
4138:E9 B6 B7 EB CF 00 B4 B1 AC
4140:A7 A5 AB AA A9 B3 B0 B2 50
4148:AD AC AE 00 AF EA AE 00 29
4150:00 00 00 9A 1C 1C 1C 0A 10
4158:FC 4A 4C AC 4C DC FC 0C 1C
4160:CA 1A 9C FC FC FA 6A BA 95
4168:8C 0A 1A 8A 0A 0A 8A 07 34
4170:07 04 01 00 20 FF EB A8 19
4178:EB CF 00 B4 E8 A7 A6 AB 0F
4180:AA A9 FE E7 E6 E5 AC AE F7
4188:00 20 20 20 00 00 00 00 19
4190:FA FC FC FC FA BC FC FC 01
4198:6C FC FC 1C FC FC FA FC C0
41A0:FC BC FA FC FC 09 0A 09 29
41A8:09 09 09 89 00 00 00 00 AB
```

Program 4: Demo

```
MF 1000 IFA=0THENA=1:PRINT"
        {CLR}{DOWN}PLEASE WAIT
        ":LOAD"CHR GRAPHICS",8
        ,1
GS 1010 SYS31744
HE 1020 POKE198,0:POKE53281,0
MS 1030 PRINT"{CLR}{9 DOWN}"
XA 1050 PRINT"{9 RIGHT}GRAPHIC
        S BORROWED FROM"
SM 1080 PRINT"{DOWN}{15 RIGHT}
        GAZETTE'S"
FB 1110 PRINT"{DOWN}{9 RIGHT}C
        ROSSROADS AND Q-BIRD"
SR 1120 DLOAD"DEMO.FILE1
XF 1130 FORX=-2TO63
GE 1140 FORM=0TO1:FORC=0TO20ST
        EP10
SG 1150 FORF=0TO8STEP2:STAMPF+
        M,X-C-F,C+F
FE 1160 NEXT:NEXT:NEXT:NEXT
BK 1170 DLOAD"DEMO.FILE2":POKE
        53281,15
CM 1180 PRINT"{CLR}{23 DOWN}"
AC 1200 PRINT"{9 RIGHT}>>> PRE
        SS ANY KEY <<<"
BC 1210 FORQ=0TO6STEP2:FORX=-1
        TO34STEP7
GK 1220 STAMP(XAND1)+Q,X,3*Q:N
        EXT:NEXT
HA 1230 FORQ=0TO6STEP2:FORX=-1
        TO34STEP7
DF 1240 STAMP(NOTXAND1)+Q,X,3*
        Q:NEXT:NEXT
XH 1250 GETK$:IFK$=""THEN1210
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Math Magic

Article on page 29.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
FR 20 X=RND(-TI):SCNCLR:COLOR4
      ,1:FAST:GOSUB1050:POKE53
      280,6:POKE53281,6
HP 30 PRINT"{HOME}"TAB(13)"{7}
      {RVS} MATH MAGIC {OFF}":
      PRINTTAB(12)"{2 DOWN}COP
      YRIGHT 1989"
AC 40 PRINTTAB(7)"COMPUTE! PUB
      LICATIONS, INC.":PRINTTA
      B(10)"ALL RIGHTS RESERVE
      D"
HG 50 PRINTTAB(11)"{2 DOWN}1 -
       ADDITION":PRINTTAB(11)"
      2 - SUBTRACTION":PRINTTA
```

```
      B(11)"3 - MULTIPLICATION
      ":PRINTTAB(11)"4 - DIVIS
      ION":SLOW
ME 60 PRINTTAB(11)"{2 DOWN}SEL
      ECT TYPE (1-4)"
GJ 70 GETKEY A$
HF 80 IFA$="1"THENPR$="A":SI$=
      "+":ELSEIFA$="2"THENPR$=
      "S":SI$="-":ELSEIFA$="3"
      THENPR$="M":SI$="X":ELSE
      IFA$="4"THENPR$="D":SI$=
      "/":ELSE70
SS 90 PRINTTAB(11)"{2 DOWN}ENT
      ER LEVEL (1-13)
      {6 SPACES}{6 LEFT}";:INP
      UT LE
CC 100 IFLE<1ORLE>13THENPRINT"
      {3 UP}";:GOTO90
QB 110 FAST:VOL0:GOSUB620:GOSU
      B820:GOSUB270:VOL15:SLO
      W
SM 120 UU=VAL(TI$):II=INT(UU/5
      ):POKE56244+II,0
HA 130 IFII>=11THEN830
KQ 140 IFJOY(2)=3THENXP=XP+5:I
      FXP>195THENXP=186:PLAY"
      O1SF"
SR 150 IFJOY(2)=7THENXP=XP-5:I
      FXP<40THENXP=45:PLAY"O1
      SF"
SK 160 MOVSPR1,XP,200
QB 170 IFJOY(2)=128THENGOSUB19
      0:GOSUB270:POKE2040,56
MR 180 GOTO120
QH 190 POKE2040,57:CC=CC+1:MOV
      SPR3,XP,190:SPRITE3,1,1
      ,0,0,0,1
BQ 200 FORY=190TO80STEP-1:MOVS
      PR3,XP,Y:NEXT
SG 210 IFXP>39ANDXP<66THENCH=1
      :ELSEIFXP>67 ANDXP<104T
      HEN CH=2:ELSEIFXP>103AN
      DXP<160THENCH=3:ELSEIFX
      P>161ANDXP<225THENCH=4
JJ 220 IFSA=CHTHENTEMPO50:PLAY
      "QO2#GO3#CF#GF#G":FL=1:
      SC=SC+10:SC$=STR$(SC):R
      R=RR+1:C1=C1+1
QM 230 IFFL=1THENCHAR1,30,7,SC
      $,1:COLOR5,1:CHAR1,31,1
      9,"{8 SPACES}",1
KF 240 IFFL=0THENTEMPO25:PLAY"
      HO1#C#DE#CG":SPRITE3,0,
      6,0,0,0,1:POKE2040,56:G
      OTO120
BB 250 FL=0:SPRITE3,0,6,0,0,0,
      1
CG 260 RETURN
DF 270 IFC1>4ANDLE=13THEN830
JF 280 IFC1>=5THENTI$="000000"
      :C1=0:SOUND2,20000,50,0
      ,2000,100:LE=LE+1:GOSUB
      820
RK 290 A1=INT(RND(1)*12)+1:A2=
      LE
GK 300 IFLE=13THENA2=INT(RND(1
      )*12)+1
QP 310 IFPR$="A"ORPR$="S"THENI
      FLE<2THENA2=INT(RND(1)*
      8)+1
AM 320 L2=LE*10
QJ 330 IFPR$="A"ORPR$="S"THENA
      2=INT(RND(1)*L2)+1
AB 340 IFPR$="S"ANDA1<A2THENT=
      A1:A1=A2:A2=T
DX 350 AN=A1*A2
GK 360 IFPR$="D"THENT=A1:A1=AN
      :AN=T
RE 370 IFPR$="A"THENAN=A1+A2
JE 380 IFPR$="S"THENAN=A1-A2
BB 390 FORI=1TO4
QM 400 T=INT(RND(1)*10)+1
DH 410 A(I)=AN+T
CR 420 IFA(I)=ANTHEN400
HE 430 AI$(I)=STR$(A(I))
JR 440 NEXT
DX 450 P=INT(RND(1)*4)+1:AI$(P
      )=STR$(AN):SA=P
SF 460 FORI=1TO4
EF 470 LL=LEN(AI$(I))
RK 480 IFLL=2THENAI$(I)=" "+AI
      $(I)
GJ 490 IFLL=4THENAI$(I)=RIGHT$
      (AI$(I),3)
QA 500 NEXT
CJ 510 PRINT"{HOME}{OFF}
      {2 DOWN}{2 RIGHT}";AI$(
      1);"{3 RIGHT}";AI$(2);"
      {3 RIGHT}";AI$(3);"
      {3 RIGHT}";AI$(4);
FH 520 A1$=STR$(A1):A2$=STR$(A
      2)
AP 530 LA=LEN(A1$):IF LA=2 THE
      N A1$=A1$+" "
CD 540 PP$=A1$+SI$+A2$+" "
QC 550 SPRITE5,1,2,0,0,0,1
XC 560 SOUND1,1000,5,,,,3
GQ 570 MOVSPR5,280,200
HD 580 FORSL=1TO250:NEXT
JA 590 SPRITE5,0,2,0,0,0,1
GA 600 COLOR5,1:CHAR 1,31,19,P
      P$,1
PQ 610 RETURN
DB 620 SCNCLR
MF 630 COLOR 0,2
FQ 640 PRINT"{7}{RVS}
      {26 SPACES}{BLK}
      {14 SPACES}";
HK 650 PRINT"{7}{RVS} {RED}
      {5 SPACES}{BLK} {YEL}
      {5 SPACES}{BLK} {GRN}
      {5 SPACES}{BLK} {BLU}
      {5 SPACES}{BLK} {7}
      {BLK}{14 SPACES}";
DJ 660 PRINT"{7}{RVS} {RED}
      {5 SPACES}{BLK} {YEL}
      {5 SPACES}{BLK} {GRN}
      {5 SPACES}{BLK} {BLU}
      {5 SPACES}{BLK} {7}
      {BLK}{14 SPACES}";
QH 670 PRINT"{7}{RVS} {RED}
      {5 SPACES}{BLK} {YEL}
      {5 SPACES}{BLK} {GRN}
      {5 SPACES}{BLK} {BLU}
      {5 SPACES}{BLK} {7}
      {BLK}{14 SPACES}";
EX 680 PRINT"{7}{RVS} {OFF}
      {BLK} {5 U} {5 U} {5 U}
       {5 U}{7}{RVS} {BLK}
      {14 SPACES}";
GP 690 PRINT"{7}{RVS} {OFF}
      {24 SPACES}{7}{RVS}
      {BLK}{14 SPACES}";
AR 700 FOR I=1TO16
FG 710 PRINT"{7}{RVS} {8}
      {OFF}{22 SPACES}{8}
      {RVS} {7} {BLK}
      {14 SPACES}";
CS 720 NEXT
CQ 730 PRINT"{7}{RVS} {8}
      {24 SPACES}{7} {BLK}
      {14 SPACES}";
AM 740 PRINT"{7}{RVS}
      {26 SPACES}{BLK}
      {14 SPACES}";
KD 750 PRINT"{BLK}";:FORI=1984
      TO2023:POKEI,160:NEXT
KK 760 PRINT"{RED}";:CHAR1,27,
      0," MATH MAGIC ",1
RF 770 PRINT"{RED}";:CHAR1,29,
      5," SCORE ",1
BS 780 CHAR1,29,10," LEVEL ",1
BE 790 SPRCOLOR1,9:SPRITE1,1,1
      ,0,0,0,1:SPRITE 4,1,6,0
      ,0,0,1:MOVSPR 4,255,195
      :MOVSPR 1,100,200
PR 800 XP=100:SC$="0":TI$="000
      000":SC=0
FQ 810 TM$="{RVS}{GRN}
      {4 SPACES}{YEL}
      {4 SPACES}{RED}
      {4 SPACES}{OFF}":RETURN
EK 820 COLOR5,1:LE$=STR$(LE):C
      HAR1,30,7,SC$,1:CHAR1,3
      0,13,LE$,1:CHAR1,28,23,
      TM$:COLOR5,1:RETURN
RA 830 IFCC=0THENCC=1
MK 840 POKE53281,6:QQ=INT((RR/
      CC)*100):QQ$=STR$(QQ)
MB 850 SCNCLR
PF 860 POKE53269,0
EK 870 SLOW
PP 880 PRINT"{7}":CHAR1,14,5,"
       GAME OVER ",1
MD 890 IFC1=5ANDLE=13THEN910
AD 900 TEMPO40:PLAY"O3HGAGRBO4
      RCO3C":GOTO980
MB 910 SPRITE4,1,6,( 0,0,1:MOV
      SPR4,168,103
SA 920 CHAR1,1,3,"CONGRATULATI
      ONS, YOU'VE GRADUATED!!
      !",1
MA 930 CHAR1,5,4," YOU HAVE EA
      RNED THE TITLE OF ",1
BX 940 CHAR1,15,5," MATH WIZ!
      {SPACE}",1
JP 950 TEMPO30:PLAY"T6O1QGAQBO
      2QDQCCQEQDQDQGQ#FQGQDO1
      QBQGAQBO2QCQDQEQDQCO1QB
      QAQBQGQ#FQGQAQDQ#FQAO2Q
      CO1QBQAQBQGQAQBO2QDQCQC
      QEQDQDQGQ#FQGQDO1QBQGAQ
      BQEO2QDQCO1QBQA"
KA 960 PLAY"QGQDQGQ#FQG"
MR 970 COLOR5,1
QJ 980 CHAR1,17,12,"SCORE",1:C
      HAR1,17,13,SC$
RE 990 CHAR 1,15,15,"% CORRECT
      ",1:CHAR 1,17,16,QQ$
XR 1000 CHAR1,10,18," PLAY AGA
      IN (Y/N)? ",1
RH 1010 GETA$:IFA$=""THEN1010
JS 1020 IFA$="Y"THENSCNCLR:POK
      E53269,0:POKE2040,56:F
      AST:RUN
PP 1030 IFA$="N"THENEND
HS 1040 GOTO1010
SP 1050 FORX=3584TO3904:READP$
      :P=DEC(P$):POKEX,P:PT=
      PT+P:NEXT
JE 1060 IFPT<>17937THENSLOW:PR
      INT"{DOWN}DATA STATEME
      NT ERROR.":STOP
MC 1070 RETURN
HE 1080 DATA00,00,00,00,00,00,
      00,10,00,00,54,00,00,D
      C,00,00,DC,00,3F,DF,F0
      ,FF,DF,FC,F0,DC,3C,F0,
      DC,3C,30,DC,30,3C,54,F
      0
SM 1090 DATA0D,11,C0,03,FF,00,
      00,30,00,00,FC,00,00,F
      C,00,00,FC,00,00,FC,00
      ,00,30,00,00,30,00,00
DH 1100 DATA00,00,00,00,00,00,
      00,30,00,00,30,00,00,F
      C,00,00,FC,00,3F,FF,F0
      ,FF,FF,FC,F0,FC,3C,FC,
      FC,FC,0F,FF,C0,00,FC
JM 1110 DATA00,00,30,00,00,30,
      00,00,30,00,00,FC,00,0
      0,FC,00,00,FC,00,00,FC
      ,00,00,30,00,00,30,00,
      00
CM 1120 DATA00,00,00,00,00,00,
      00,10,00,00,54,00,00,1
      0,00,00,10,00,00,10,00
      ,00,10,00,00,10,00,00,
      10,00,00,10,00,00,54,0
      0,01,11
```

```
KB 1130 DATA00,00,00,00,00,00,
        00,00,00,00,00,00,00,0
        0,00,00,00,00,00,00,00
        ,00,00,00,00,00
BB 1140 DATA2A,80,00,22,A0,00,
        02,A8,00,02,A8,00,03,F
        C,00,03,FC,00,0B,FE,0F
        ,02,F8,3F,0A,AA,28,2A,
        AA,A8,AA,AA
SJ 1150 DATAA0,A8,AA,80,2B,A8,
        00,2B,A8,00,02,A8,00,0
        2,A8,00,0A,AA,00,0A,AA
        ,00,2A,AA,80,2A,AA,80,
        0A,AA,00,B9
HA 1160 DATA00,00,20,00,A0,00,
        20,00,00,00,08,00,00,2
        A,08,00,AA,80,00,2A,00
        ,00,08,00,02,00,00,2A,
        02,8A,28
HM 1170 DATA02,A8,08,A0,00,00,
        28,08,20,00,28,02,00,2
        A,0A,80,08,02,08,00,00
        ,2A,00,20,08,02,00,00,
        00,00,00,00,81,00
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

Monster Bar-B-Q

Article on page 28.

```
FH 10 REM COPYRIGHT 1989 COMPU
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FH 20 SCNCLR:COLOR0,1:COLOR4,1
      :SPRCOLOR2,12:VOL3:X=RND
      (-TI/101)
EE 30 P1$=">######":HS=-1500
BQ 40 FORI=2TO8:SPRITEI,0,,1,0
      ,0,1:MOVSPRI,0#0:NEXT:SP
      RITE1,0,7,0,0,0,0
RS 50 DIMMP(14,2),JS(9,3,2),GR
      (7),MC(7),MN$(7)
XC 60 GOSUB820:GOSUB1290:GOSUB
      1020
XC 70 DEFFNR(X)=INT(RND(1)*X+1
      )
DQ 80 MC(1)=4:MC(2)=9:MC(3)=14
      :MC(4)=3:MC(5)=6:MC(6)=9
      :MC(7)=11
JR 90 JX=5:JY=3:SC=0:MF=0:MM=0
      :Z=1:C=0:D=0:Q=0:T=0
QD 100 GRAPHIC3:MOVSPR1,JS(JX,
       JY,0),JS(JX,JY,1):SPRIT
       E1,1:TI$="000000"
BE 110 GOSUB 400
SD 120 IF MM+MF>=10 THEN 650
CR 130 GOSUB 580
KK 140 GOSUB 420
HM 150 GOTO110
JR 160 JS=JOY(2):ONJSGOTO190,2
       00,210,220,230,240,250,
       260
PG 170 IFJS>127THENGOSUB330
MS 180 GOTO320
RE 190 JY=JY-Z:GOTO270
QX 200 JX=JX+Z:JY=JY-Z:GOTO270
PG 210 JX=JX+Z:GOTO270
GQ 220 JX=JX+Z:JY=JY+Z:GOTO270
GE 230 JY=JY+Z:GOTO270
QK 240 JX=JX-Z:JY=JY+Z:GOTO270
FM 250 JX=JX-Z:GOTO270
GF 260 JX=JX-Z:JY=JY-Z
GX 270 IFJX<1THENJX=9
CK 280 IFJX>9THENJX=1
JM 290 IFJY<1THENJY=1
FK 300 IFJY>3THENJY=3
MJ 310 MOVSPR1,JS(JX,JY,0),JS(
       JX,JY,1)
XM 320 RETURN
DJ 330 SPRITE1,0:SOUND1,30000,
       30,1,5000,500,3:SPRITE1
       ,1
XQ 340 IFMP(JS(JX,JY,2),2)=0TH
       ENMF=MF+1:GOTO390
CM 350 C=MP(JS(JX,JY,2),2):SC=
       SC+1
BE 360 SPRITEC,,8,,,,0:SOUND2,
       60000,10,0,30000,3163,1
AF 370 FORI=1TO6:MOVSPRC,+0,+4
       :NEXT
JQ 380 MP(GR(C-1),2)=0:GR(C-1)
       =0:D=C
PX 390 RETURN
KF 400 EY=FNR(15)-1:IFEYTHENCH
       AR3,6,1,"WW":ELSECHAR1,
       6,1,"--"
EX 410 RETURN
PP 420 M=FNR(7):IFM+1=DTHEN420
QB 430 IFFNR(10)>QTHEN560
ER 440 GOSUB160
QS 450 IFMP(GR(M),2)THEN540
JF 460 G=FNR(14):IFMP(G,2)THEN
       460
JX 470 GOSUB160
MR 480 GR(M)=G:MOVSPRM+1,MP(G,
       0),MP(G,1)+24
CQ 490 R=FNR(7):SPRSAVMN$(R),M
       +1:SPRITEM+1,1,MC(R),,,
       ,1
PS 500 GOSUB160
GJ 510 MP(G,2)=M+1
RA 520 SOUND2,3000,12,0,500,20
       0,0:FORI=1TO12:MOVSPRM+
       1,+0,-2:NEXT
QH 530 GOTO560
ME 540 SOUND2,3000,12,1,500,20
       0,0:FORI=1TO12:MOVSPRM+
       1,+0,+2:NEXT
DC 550 MP(GR(M),2)=0:GR(M)=0:M
       M=MM+1
AF 560 GOSUB160
JM 570 RETURN
QG 580 IFTI<TTHEN630
MM 590 T=T+3900:Q=Q+2:IFQ>10TH
       EN640
HC 600 VOL0:SOUND1,175,250,2,1
       00,3,3
DB 610 COLOR2,2:FORJ=1TO2:FORI
       =1TO5:VOLI*2:DRAW2,83,6
       TO72,56:COLOR0,4:DRAW1,
       83,6TO72,56:COLOR0,1:NE
       XT:SLEEP1:NEXT:VOL3
FD 620 IFQ<11THENSOUND3,37000,
       3750,2,24000,4000,2,408
       0
DR 630 RETURN
HE 640 FORK=1TO2:GOSUB600:NEXT
FB 650 FORI=1TO8:SPRITEI,0:NEX
       T:GRAPHIC0
FK 660 WINDOW3,14,38,18,1:WIND
       OW5,14,37,19,1
PF 670 PRINT"{GRN}MONSTERS
       {2 SPACES}{6}";:PRINT U
       SING P1$;SC;:PRINT"
       {GRN} * 100 ={RED}";SC*
       100
QM 680 PRINT"{GRN}MISFIRES
       {2 SPACES}{6}";:PRINT U
       SING P1$;MF;:PRINT"
       {GRN} *{2 SPACES}50 =
       {RED}";MF*-50
KE 690 PRINT"{GRN}SURVIVORS
       {6}";:PRINT USING P1$;M
       M;:PRINT"{GRN} * 150 =
       {SPACE}{RED}";MM*-150
MS 700 PRINT"{5}{25 SPACES}
       {6 Y}"
SQ 710 SC=SC*100-MF*50-MM*150:
       PRINT"{CYN}TOTAL SCORE:
       {11 SPACES}";:PRINT USI
       NG P1$;SC
HQ 720 IFSC>HSTHENHS=SC
CG 730 PRINT"{CYN}HIGH SCORE:
       {12 SPACES}";:PRINT USI
       NG P1$;HS;
KM 740 PRINT"{2 HOME}";
CG 750 K$=""
MP 760 DO:GETK$
BK 770 CHAR,14,20,"{1}PLAY AGA
       IN ?"
QQ 780 IFK$="Y"THENWINDOW5,14,
       37,20,1:PRINT"{2 CLR}":
       GOSUB1320:SOUND3,0,0:GO
       TO70
QE 790 IFK$="N"THEN PRINT"
       {CLR}":SOUND 3,0,0:EXIT
AP 800 CHAR,14,20,"{YEL}PLAY A
       GAIN ?"
PF 810 LOOP:END
SG 820 SOUND3,37000,950,2,2400
       0,4000,2,4070
SA 830 CHAR,4,0,"{5}{*}{8}£
       {5}{*}{8}£{RVS}{5} {8}
        {5}{2 SPACES}{8}
       {2 SPACES}{5} {8} {5}
       {2 SPACES}{8}{2 SPACES}
       {5}{2 SPACES}{8}
       {2 SPACES}{5} {8} {5}
       {2 SPACES}{8}{2 SPACES}
       {5} {8} {OFF}{5}{*}{8}
       £{5}{*}{8}£"
GR 840 CHAR,8,1,"{5}{*}{8}£
       {RVS}{5}{2 SPACES}{8}
       {2 SPACES}{OFF}{5}{*}
       {8}£{5}{*}{RVS} {8}
       {OFF}£{5}{*}{RVS} {8}
       {SPACE}{OFF}£{5}{*}{8}
       £{RVS}{5}{2 SPACES}{8}
       {2 SPACES}{OFF}{5}{*}
       {8}£"
QH 850 CHAR,10,2,"{5}{*}{RVS}
       {SPACE}{8} {OFF}£
       {3 SPACES}{5}{*}{8}£
       {2 SPACES}{5}{*}{8}£
       {3 SPACES}{5}{*}{RVS}
       {8} {OFF}£"
BD 860 CHAR,11,3,"{5}{*}{8}£
       {14 SPACES}{5}{*}{8}£"
RA 870 CHAR,13,21,"{RVS}{5}£
       {8}{*}{OFF}{10 SPACES}
       {RVS}{5}£{8}{*}"
FJ 880 CHAR,12,22,"{RVS}{5}£
       {SPACE}{8} {*}{OFF}
       {8 SPACES}{RVS}{5}£
       {8} {*}"
MX 890 CHAR,10,23,"{RVS}{5}£
       {8}{*}{5}{2 SPACES}{8}
       {2 SPACES}{5}£{8}{*}
       {5}£{8}{*}{5}£{8}{*}
       {5}£{8}{*}{5}
       {2 SPACES}{8}{2 SPACES}
       {5}£{8}{*}"
FJ 900 CHAR,6,24,"{RVS}{5}£
       {8}{*}{5}£{8}{*}{5}
       {8} {5}{2 SPACES}{8}
       {2 SPACES}{5} {8} {5}
       {8} {5} {8} {5} {8} {5}
       {2 SPACES}{8}{2 SPACES}
       {5} {8} £{8}{*}{5}£
       {8}{*}{HOME}"
PG 910 CHAR,3,5,"{BLU}{RVS}
       {*}£ {RIGHT}£
       {2 SPACES}{*}{RIGHT}
       {2 SPACES}{*} {RIGHT}£
       {2 SPACES}{*}{RIGHT}
       {4 SPACES}{RIGHT} {3 @}
       {RIGHT} {F} {*}"
BA 920 CHAR,3,6,"{7}{4 SPACES}
       {RIGHT} {L}{J} {RIGHT}
       {4 SPACES}{RIGHT}{OFF}
       {*}{RVS}{2 SPACES}{*}
       {2 RIGHT}{2 SPACES}
```

```
        {2 RIGHT}{3 SPACES}
        {2 RIGHT} {V} {OFF}£"
MP 930  CHAR,3,7,"{CYN}{RVS}
        {OFF}{*}£{RVS} {RIGHT}
        {OFF}{*}{RVS}{2 SPACES}
        {OFF}£{RIGHT}{RVS}
        {OFF}{*}{RVS}{2 SPACES}
        {RIGHT}{OFF}{*}{RVS}
        {2 SPACES}{OFF}£
        {2 RIGHT}{RVS}
        {2 SPACES}{2 RIGHT}
        {3 T}{RIGHT} {OFF}{*}
        {RVS}{2 SPACES}"
GB 940  CHAR,3,9,"{3}{RVS} {D}
        {SPACE}{*}{2 RIGHT}£
        {*}{2 RIGHT}{3 SPACES}
        {*}{6 RIGHT} {D} {*}
        {6 RIGHT}£{2 SPACES}
        {*}"
GA 950  CHAR,3,10,"{1} {C}
        {OFF}£{RIGHT}{RVS}£
        {2 SPACES}{*}{RIGHT}
        {L}{J} {RIGHT}{OFF}
        {4 O}{RIGHT}{RVS} {C}
        {OFF}£{RIGHT}{4 O}
        {RIGHT}{RVS} {D}{F} "
FP 960  CHAR,3,11,"{RED} {D}
        {*}{RIGHT} {C}{V}
        {RIGHT}{3 SPACES}{OFF}
        £{RIGHT}{4 U}{RIGHT}
        {RVS} {D} {*}{RIGHT}
        {OFF}{4 U}{RIGHT}{RVS}
        {SPACE}{C} {D}"
BF 970  CHAR,3,12,"{2} {C}
        {OFF}£{RIGHT}{RVS} {D}
        {F} {RIGHT} {L}{OFF}{*}
        {RVS} {6 RIGHT} {C}
        {OFF}£{6 RIGHT}{*}
        {RVS} {D} "
FE 980  CHAR,12,15,"{OFF}{7}COP
        YRIGHT 1989"
RM 990  CHAR,6,16,"{OFF}{7}COMP
        UTE! PUBLICATIONS, INC.
        "
FG 1000 CHAR,10,17,"{OFF}{7}AL
        L RIGHTS RESERVED"
DS 1010 RETURN
AK 1020 FAST:GRAPHIC3,1
AJ 1030 COLOR1,12:COLOR2,13:CO
        LOR3,16:WIDTH1
DD 1040 CIRCLE2,6,6,6,6:PAINT2
        ,6,6
JH 1050 BOX2,0,6,12,24,,1
FE 1060 CIRCLE3,10,6,6,6:PAINT
        3,10,6
SX 1070 BOX3,4,6,16,24,,1
HG 1080 DRAW2,6,12TO6,6TO8,6TO
        8,9TO7,9TO7,10TO8,12
EP 1090 DRAW2,10,6TO10,12:DRAW
        2,12,12TO12,6TO14,6TO1
        4,9TO13,9
KF 1100 SSHAPET$,0,0,16,24
SG 1110 BOX0,0,0,16,24,,1
EX 1120 FORY=104TO168STEP64:FO
        RX=8TO136STEP32:GSHAPE
        T$,X,Y:NEXTX,Y
QQ 1130 FORX=24TO120STEP32:GSH
        APET$,X,136:NEXT
RB 1140 FORX=0TO39:FORY=0TO7:C
        HAR1,X,Y," ",1:NEXTY,X
MD 1150 DRAW0,6,0TO8,36TO20,38
        TO20,24TO24,16TO24,8TO
        22,8TO24,6TO25,8TO28,7
        TO31,8TO32,4TO34,8TO32
        ,8TO32,16TO34,24TO30,3
        8
BM 1160 DRAW0,30,38TO44,40TO48
        ,32TO48,24TO48,32TO56,
        24TO48,33TO43,41TO60,3
        8TO52,39TO56,47TO52,39
        TO28,43
SJ 1170 DRAW0,28,43TO27,51TO24
        ,51TO20,44TO12,46TO9,5
        0TO10,64:PAINT0,0,0:DR
        AW0,24,7:DRAW0,32,7TO3
        3,7
EQ 1180 COLOR3,8:CHAR3,6,1,"WW
        ":DRAW2,28,16TO26,18TO
        26,20TO28,19:COLOR3,12
        :WIDTH2:DRAW3,24,38TO2
        5,40:DRAW3,28,38TO29,4
        0:DRAW1,11,64TO12,80
PQ 1190 DRAW0,12,64TO28,62TO32
        ,63TO36,61TO40,60TO56,
        62TO60,64TO88,56TO124,
        56TO132,60TO152,64:PAI
        NT0,89,57:PAINT0,56,63
        :PAINT0,29,63:CHAR1,37
        ,8,"{T}{Y}{T}"
PX 1200 CHAR1,24,1,"£ {*}":CH
        AR1,24,2,"{J} {L}":CHA
        R1,28,2,"{L}"
SD 1210 CHAR1,23,3,"£
        {5 SPACES}{*}":CHAR1,2
        3,4,"{J}{5 SPACES}{L}"
        :CHAR1,22,5,"£
        {7 SPACES}{*}"
BR 1220 CHAR1,23,6,"{7 SPACES}
        ":CHAR1,22,6,"-",1:CHA
        R1,30,6,"-",1
JJ 1230 COLOR3,8:CHAR3,25,2,"+
        ",1:CHAR3,24,6,"+",1:C
        HAR3,26,6,"+",1:CHAR3,
        28,4,"+",1
PH 1240 WIDTH1:DRAW0,160,48TO1
        52,48TO160,49:DRAW0,16
        0,26TO144,25TO136,16TO
        144,25TO144,16TO144,25
        TO160,30:PAINT0,159,27
KE 1250 RESTORE1270:DO:READC$:
        IFC$="*"THENEXIT
FJ 1260 READX,Y:CHAR1,X,Y,C$,1
        :LOOP
KQ 1270 DATA"{B}",10,3,"{B}{D}
        {B}",12,2,"{B}",15,4,"
        {B}",15,5,"{B}",13,6,"
        {B}",35,0,"{B} {V}{F}
        {SPACE}{V}",33,1,"{V}
        {B}",32,2,"{B}{C}",37,
        2,"{B}{V}",33,3,"{C}
        {D}{2 V}{2 SPACES}{B}"
        ,32,4,"{C} {B}{D}",34,
        5,"{V}{B}{D}",35,6,"
        {2 V}{C}",36,7,*
BS 1280 SLOW:RETURN
RK 1290 RESTORE1450
GB 1300 FORI=3584TO4095:READJ:
        X1=X1+J:POKEI,J:NEXT:I
        FX1<>56999THENPRINT"
        {CLR}ERROR IN SPRITE D
        ATA.":STOP
BC 1310 FORI=1TO7:SPRSAVI+1,MN
        $(I):NEXT
CG 1320 A=1:Y=132
XX 1330 DOWHILEY<197:IFY=164TH
        ENX=78:ELSEX=46
PB 1340 DOWHILEX<303:MP(A,0)=X
        :MP(A,1)=Y:MP(A,2)=0
EB 1350 A=A+1:X=X+64:LOOP:Y=Y+
        32:LOOP
PS 1360 Y=132:FORJ=1TO3:X=46:F
        ORI=1TO9
RB 1370 JS(I,J,0)=X:JS(I,J,1)=
        Y:JS(I,J,2)=0
FR 1380 X=X+32:NEXT:Y=Y+32:NEX
        T
HR 1390 I=1:J=1:X=1:Y=-1:DO
CR 1400 IFYTHENJS(I,J,2)=X:X=X
        +1
MX 1410 I=I+1:IFI>9THENI=1:J=J
        +1
GE 1420 Y=NOT(Y):LOOPUNTILX>14
QX 1430 FORI=1TO7:GR(I)=0:NEXT
        :RETURN
BA 1440 REM SPRITE DATA
SB 1450 DATA ,,,,,,,,,,,,24,,
        ,255,,1,153,128,3,24,1
        92,6,,96,6,,96,31,153
KB 1460 DATA 248,6,,96,6,,96,3
        ,24,192,1,153,128,,255
        ,,,24,,,,,,,,,,,,0
CM 1470 DATA ,255,,15,255,240,
        63,126,252,61,86,188,5
        3,85,172,53,85,172,191
        ,86,254,187,219,238,18
        6,154,174,152,24,42,15
        4,154
XG 1480 DATA 170,149,89,106,16
        5,154,106,166,170,170,
        36,85,40,232,65,43,248
        ,,47,248,65,47,250,170
        ,175,62,170,188,255,17
        0,255,0
KB 1490 DATA 2,171,192,10,170,
        240,42,170,188,42,170,
        188,171,170,255,170,23
        5,255,168,44,63,168,10
        9,63,170,171,255,234,1
        31,255,42,171
BA 1500 DATA 252,42,151,252,42
        ,65,252,40,65,60,56,13
        0,60,8,,48,10,65,240,1
        0,151,240,10,175,240,4
        2,191,252,170,175,175,
        0
KR 1510 DATA 15,255,240,62,255
        ,252,58,239,188,10,171
        ,172,10,170,172,10,170
        ,172,15,239,232,4,100,
        104,15,239,232,15,171,
        232,10,238
KJ 1520 DATA 172,10,170,160,10
        ,170,160,,2,163,42,168
        ,175,42,170,163,10,170
        ,176,58,170,252,250,17
        1,255,254,175,255,255,
        255,255,0
HG 1530 DATA 10,170,,42,170,12
        8,168,42,32,184,8,32,1
        72,73,32,184,8,32,170,
        170,168,170,174,168,23
        8,175,160,35,170,160,4
        0,68
DH 1540 DATA 64,56,136,128,10,
        34,32,14,17,16,2,170,1
        68,3,170,168,,44,,,171
        ,,,44,,44,171,56,170,1
        70,170,0
KX 1550 DATA ,44,,,44,,,239,,3
        ,174,192,14,174,176,10
        ,170,160,15,170,240,63
        ,235,252,41,255,104,41
        ,20,104,45,85
JR 1560 DATA 120,239,235,251,1
        75,170,250,238,170,187
        ,170,255,170,235,,235,
        168,,42,46,170,184,234
        ,170,171,170,170,170,1
        70,170,170,0
CM 1570 DATA ,215,192,3,95,80,
        4,255,240,13,53,92,19,
        213,84,55,95,244,61,12
        0,128,21,202,140,31,,2
        44,60,63,92,5,245
JX 1580 DATA 112,29,95,244,31,
        255,92,7,213,204,13,25
        5,208,3,127,112,3,212,
        ,,255,,,124,192,7,23,2
        08,85,223,93,0
XX 1590 DATA 64,255,1,147,,198
        ,22,,148,58,130,172,10
        ,170,160,,170,,143,40,
        243,164,239,31,172,109
        ,63,171,239,255,234,17
        4
DM 1600 DATA 191,42,174,188,58
        ,174,188,10,,176,8,40,
        48,8,85,48,10,171,240,
        8,131,48,10,,240,42,13
        1,252,170,175,175,0
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s Gazette Programs," elsewhere in this issue.

1581 Directory Sorter

Article on page 48.

```
BH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
      - ALL RIGHTS RESERVED
BR 20 DIM Z$(297),SG$(297):V=0
      :B=1:MB=4:ME=16:Q$=CHR$(
      34)
ED 30 POKE53280,0:POKE53281,0:
      PRINT"{GRN}";:O$="":FORA
      =1TO30:O$=O$+CHR$(0):NEX
      TA
KR 40 WD=20:IFFRE(0)=FRE(1)THE
      NOM=3:GOTO60
GM 50 IF(PEEK(215)AND128)THENO
      M=1:WD=40:ELSEOM=2
FM 60 PRINT"{CLR}{N}{YEL}
      {4 DOWN}"TAB(WD-2)"1581"
      :PRINTTAB(WD-8)"DIRECTOR
      Y SORTER"
PP 70 PRINT"{7}{4 DOWN}"TAB(WD
      -7)"COPYRIGHT 1989"
CQ 80 PRINTTAB(WD-13)"COMPUTE!
       PUBLICATIONS, INC."
KP 90 PRINTTAB(WD-9)"ALL RIGHT
      S RESERVED"
CA 100 PRINT"{HOME}{17 DOWN}
      {YEL}"TAB(WD-12)"DRIVE
      {SPACE}NUMBER (0=QUIT)
      {2 SPACES}8{2 SPACES}
      {5 LEFT}";
SR 110 INPUTDV$:DV=VAL(DV$):IF
      DV=0THENEND
SK 120 IFDV<8ORDV>30THENPRINTT
      AB(WD-11)"{DOWN}{WHT}
      {RVS}{2 SPACES}INVALID
      {SPACE}DRIVE NO.
      {2 SPACES}":GOTO100
HR 130 IFOM=3THENPOKE780,DV
CC 140 IFOM<3THENPOKE6,DV
AE 150 POKE144,0:SYS65457:TS=S
      T:SYS65454:TS=TSORST
DR 160 IFTSTHENPRINTTAB(WD-11)
      "{DOWN}{WHT}{RVS}
      {2 SPACES}DEVICE NOT PR
      ESENT ":GOTO100
DR 170 OPEN15,DV,15,"UI":INPUT
      #15,A$,B$,C$,D$:CLOSE15
XG 180 IFRIGHT$(B$,2)<>"81"THE
      NPRINTTAB(WD-11)"{DOWN}
      {WHT}{RVS}DEVICE"DV"
      {LEFT} ISN'T AN 81":GOT
      O100
PB 190 PRINT"{CLR}{5 DOWN}"TAB
      (WD-15)"----------------
      ----------"
DA 200 PRINT"{DOWN}"TAB(WD-11)
      "PRESS {WHT}{RVS} A
      {OFF}{YEL} FOR A-Z SORT
      ."
EX 210 PRINT"{DOWN}"TAB(WD-11)
      "PRESS {WHT}{RVS} Z
      {OFF}{YEL} FOR Z-A SORT
      ."
CQ 220 PRINT"{DOWN}"TAB(WD-13)
      "PRESS {WHT}{RVS} M
      {OFF}{YEL} FOR MANUAL S
      ORT."
XR 230 PRINT"{DOWN}"TAB(WD-15)
      "----------------------
      --------"
RG 240 GETSO$:IFSO$<>"A"ANDSO$
      <>"M"ANDSO$<>"Z"THEN240
MX 250 IFOM=2THENPRINT"
      {3 DOWN}{WHT}"TAB(WD-14
      )"SCREEN WILL BLANK DUR
      ING LOAD{YEL}":SLEEP1:F
      AST
EM 260 PRINT"{CLR}{18 DOWN}SCA
      NNING";
BF 270 OPEN15,DV,15,"I0":OPEN5
      ,DV,5,"#":S=3
GG 280 PRINT#15,"U1:";5;0;40;S
      :GET#5,T$,S$:S=ASC(S$+C
      HR$(0))
AX 290 A$="":L=2:FORE=0TO29:GE
      T#5,B$:A$=A$+CHR$(ASC(B
      $+CHR$(0))):NEXTE:GOSUB
      560
QA 300 GET#5,B$,B$:FORRA=1TO6:
      A$=""
RR 310 FORE=0TO29:GET#5,B$:A$=
      A$+CHR$(ASC(B$+CHR$(0))
      ):NEXTE:GOSUB560
DS 320 GET#5,B$,B$:NEXTRA:A$="
      "
FQ 330 FORE=0TO29:GET#5,B$:A$=
      A$+CHR$(ASC(B$+CHR$(0))
      ):NEXTE:GOSUB560
GE 340 IFASC(T$+CHR$(0))=40THE
      N280
KF 350 PRINT:PRINT#15,"U1:";5;
      0;40;0:GET#5,A$,A$,A$,A
      $:H$="":FORZ=1TO16:GET#
      5,A$
AP 360 H$=H$+A$:NEXT:CLOSE5:CL
      OSE15:IFOM=2THENSLOW
KB 370 GOSUB660:PRINT"{CLR}
      {YEL}SAVE THIS NEW DIRE
      CTORY? ";
CP 380 GETA$:IFA$<>"Y"ANDA$<>"
      N"THEN380
DE 390 PRINTA$:IFA$="N"THEN520
BE 400 IFOM=2THENPRINT"
      {3 DOWN}{WHT}"TAB(WD-14
      )"SCREEN WILL BLANK DUR
      ING SAVE{YEL}":SLEEP1:F
      AST
BS 410 CLOSE 15:OPEN15,DV,15,"
      I0":OPEN5,DV,5,"#":S=3
RB 420 IF8*(V/8)>INT(V/8)*8THE
      NV=INT((V/8)+1)*8
XC 430 H$="":FORB=3TOV/8+2:AK$
      =""
FH 440 PRINT#15,"B-P:";5;0:IFB
      <V/8+2THENPRINT#5,CHR$(
      40)+CHR$(B+1);
MR 450 IFB=V/8+2THENPRINT#5,CH
      R$(0)+CHR$(255);
MH 460 FORZ=1TO30:PRINT#5,CHR$
      (ASC(MID$(Z$(1+(B-3)*8)
      ,Z,1)+CHR$(0)));:NEXTZ
HP 470 FORG=2TO8:PRINT#5,CHR$(
      0)+CHR$(0);:FORZ=1TO30
DD 480 PRINT#5,CHR$(ASC(MID$(Z
      $(G+(B-3)*8),Z,1)+CHR$(
      0)));:NEXTZ,G
GC 490 PRINT#15,"U2:";5;0;40;B
      :NEXTB
AG 500 CLOSE5:CLOSE15:IFOM=2TH
      ENSLOW
HM 510 PRINT"{CLR}{2 DOWN}
      {YEL}COLLECTING DISK...
      {DOWN}":OPEN15,DV,15,"V
      0:":CLOSE15
RD 520 PRINT"{DOWN}DO YOU WANT
       TO TRY ANOTHER? ";
JR 530 GETA$:IFA$<>"Y"ANDA$<>"
      N"THEN530
CX 540 PRINTA$:IFA$="Y"THENCLR
      :GOTO20
AJ 550 END
KC 560 IFA$=O$THENRETURN
MS 570 IFSO$="M"ANDV<>0THEN630
BG 580 IFV<>0THENFORB=1TOV
FR 590 IFSO$="Z"THEN620
MJ 600 IFV<>0THENIFMID$(A$,4,1
      6)>MID$(Z$(B),4,16)THEN
      NEXTB
CM 610 GOTO630
EM 620 IFV<>0THENIFMID$(A$,4,1
      6)<MID$(Z$(B),4,16)THEN
      NEXTB
RQ 630 PRINT".";:FORC=V+1TOBST
      EP-1:Z$(C)=Z$(C-1):NEXT
      C:Z$(B)=A$:IFV<296THENV
      =V+1
FH 640 IFV<296ANDSO$="M"THENB=
      B+1
PX 650 RETURN
PB 660 K=1:CC$="{WHT}"
XR 670 JJ=96:IFOM>1THENJJ=48
FE 680 IFV-K<JJTHENJJ=V-K+1
QS 690 IFG=0THENO=0
XP 700 PRINT"{CLR}{YEL}";:A=1
KQ 710 IFA<25THENCL=0:GOTO760
BK 720 IFA>72ANDA<97THENCL=60:
      GOTO750
QA 730 IFA>48ANDA<73THENCL=40:
      GOTO750
HG 740 IFA>24ANDA<49THENCL=20
HJ 750 IFA=25ORA=49ORA=73THENP
      RINT"{HOME}";
BS 760 MB=4:ME=16:IFA$<>"GB"TH
      EN810
MP 770 IF(A+K-1)>=GSAND(A+K-1)
      <=GFTHEN790
EH 780 GOTO810
GH 790 PRINTTAB(CL)CC$"{RVS}"Q
      $MID$(Z$(A+K-1),MB,ME)Q
      $"{OFF}{YEL}"
PG 800 GOTO830
BK 810 PRINTTAB(CL)Q$MID$(Z$(A
      +K-1),MB,ME)Q$"{YEL}"
AJ 820 IFA$="GB"THEN830
RX 830 IFA<=(JJ-1)THENA=A+1:GO
      TO710
GA 840 IFA$="GB"THEN1410
KF 850 IFG<>2THENPRINT"{HOME}
      {YEL}{RVS}"CC$Q$MID$(Z$
      (K+O),MB,ME)Q$"{OFF}";
CG 860 IFG=2ANDK+O=>GSTHENPRIN
      T"{HOME}{RVS}{8}"Q$MID$
      (Z$(K+O),MB,ME)Q$"{OFF}
      ";
GB 870 IFG=2ANDK+O<GSTHENPRINT
      "{HOME}{YEL}{RVS}"CC$Q$
      MID$(Z$(K+O),MB,ME)Q$"
      {OFF}";
BG 880 IFG=1AND(A$="PS"ORA$="G
      B")THENGOSUB1620:IFG<>2
      THEN880
JM 890 GETA$:IFA$=""THEN890
DB 900 IFG=2ANDA$="{DOWN}"ANDK
      +O=(V-GT)+1THEN890
QQ 910 IFO=JJ-1ANDA$="{DOWN}"T
      HEN890
DQ 920 IFO=0ANDA$="{UP}"THEN89
      0
BK 930 IFA$="{DOWN}"THENGOSUB1
      410:RV=1:O=O+1:GOSUB141
      0:GOTO890
PC 940 IFA$="{UP}"THENGOSUB 14
      10:RV=1:O=O-1:GOSUB1410
      :GOTO890
FR 950 IFA$="-"ANDOM>1ANDK-48>
      =1THENK=K-48:O=0:GOTO67
      0
JR 960 IFA$="-"ANDOM=1ANDK-96>
      =1THENK=K-96:O=0:GOTO67
      0
MR 970 IFA$="+"ANDOM>1ANDK+48<
      VTHENK=K+48:O=0:GOTO670
AM 980 IFA$="+"ANDOM=1ANDK+96<
      VTHENK=K+96:O=0:GOTO670
DJ 990 IFA<=JJ-1THENA=A+1:GOTO
      710
```

```
QC 1000 IFA$="{RIGHT}"ANDO<JJ-
        24THENGOSUB1320:RV=1:O
        =O+24:GOSUB1320:GOTO089
        0
CD 1010 IFA$="{LEFT}"ANDO>23TH
        ENGOSUB1320:RV=1:O=O-2
        4:GOSUB 1320:GOTO890
GA 1020 IFA$="↑"THENGOSUB1320:
        RV=1:GOSUB1320:GOTO890
EF 1030 IFA$=CHR$(222)THENGOSU
        B1320:RV=1:GOSUB 1320:
        GOTO890
GC 1040 IFA$="{HOME}"THENGOSUB
         1410:RV=1:O=0:GOSUB14
        10:GOTO890
JA 1050 IFA$="G"ANDG=2ANDK+O<=
        V-GT+1THEN1840
PE 1060 IFA$="G"ANDG=0THENG=1:
        GOTO1610
QC 1070 IFA$="PS"ANDG>0THEN680
PJ 1080 IFA$="G"ANDG=1THENG=2:
        O=0:CC$="{6}":GOTO670
KB 1090 IFA$="F"ANDG=2THENGOSU
        B1160
SH 1100 IFA$="PS"AND(G=0ORG=2)
        THEN670
JD 1110 IFA$="C"ANDG=2THEN1830
SD 1120 IFA$="Q"ANDG=0THENRETU
        RN
RJ 1130 GOTO890
QB 1140 GETA$:IFA$<>"Y"ANDA$<>
        "N"THEN1140
KS 1150 CLOSE5:CLOSE15:END
KF 1160 Z=0:GE=INT(GT/10)+1
SK 1170 B=0:FORGP=1TOGE
KM 1180 PRINT"{CLR}"
SR 1190 PRINT"{YEL}{CLR}
        {2 DOWN}"TAB(WD-10)"FI
        LE(S) FOR PLACEMENT"
GE 1200 PRINTTAB(WD-10)"{21 T}
        "
HM 1210 PRINTTAB(WD-15)"DIR LO
        CT{9 SPACES}FILE NAME"
JG 1220 PRINTTAB(WD-15)"{8 T}
        {9 SPACES}{9 T}{3}"
MK 1230 B=B+1:IFB=11ORSG$(Z)="
        "THENB=0:GOTO1260
CA 1240 IFSG$(Z)<>""THENPRINTT
        AB(WD-14)"{8}"GS+ZTAB(
        WD-2)"{3}"Q$MID$(SG$(Z
        ),4,16)Q$
FP 1250 Z=Z+1:IFZ<=GTTHEN1230
HR 1260 PRINT"{DOWN}{8}"TAB(WD
        -8)"GROUP TOTAL=";GT
MD 1270 PRINT"{DOWN}{WHT}"TAB(
        WD-10)"PRESS {RVS} E
        {OFF} END DISPLAY"
KE 1280 PRINT"{DOWN}"TAB(WD-12
        )"PRESS RETURN TO CONT
        INUE{3}"
BA 1290 GETR1$:IFR1$<>CHR$(13)
        ANDR1$<>"E"THEN1290
MM 1300 IFR1$=CHR$(13)ANDSG$(Z
        )<>""THENNEXTGP
BD 1310 Z=0:GP=0:GE=0:A$="PS":
        O=0:RETURN
QQ 1320 CR=0:CD=0:CP=0
KF 1330 IFA$="↑"ANDRV=1ANDO<24
        THENO=0
CP 1340 IFA$="↑"ANDRV=1ANDO<48
        ANDO>24THENO=24
FC 1350 IFA$="↑"ANDRV=1ANDO<72
        ANDO>48THENO=48
JG 1360 IFA$="↑"ANDRV=1ANDO<96
        ANDO>72THENO=72
GG 1370 IFA$=CHR$(222)ANDRV=1A
        NDO<24THENO=23
BS 1380 IFA$=CHR$(222)ANDRV=1A
        NDO<48ANDO>23THENO=47
HS 1390 IFA$=CHR$(222)ANDRV=1A
        NDO<72ANDO>47THENO=71
AD 1400 IFA$=CHR$(222)ANDRV=1A
        NDO<96ANDO>71THENO=95
AG 1410 IFO>JJ-1THENO=JJ-1
KG 1420 CR=0:CD=0:CP=0
PX 1430 IFO<24THENCD=O:GOTO153
        0
KE 1440 IFO>23ANDO<48THENCR=20
        :GOTO1480
JS 1450 IFOM<>1THEN1480
SH 1460 IFO>47ANDO<72ANDOM=1TH
        ENCR=40:GOTO1480
EQ 1470 IFO>71ANDO<96ANDOM=1TH
        ENCR=60
AM 1480 IFO>=72THENCD=O-72:GOT
        O1510
DX 1490 IFO>=48THENCD=O-48:GOT
        O1520
GH 1500 IFO>=25THENCD=O-24
HG 1510 IFO>95ANDOM=1THENO=95:
        RETURN
SP 1520 IFOM>1ANDO>47THENO=47:
        RETURN
BB 1530 PRINT"{HOME}";:IFCD=0T
        HEN1550
QQ 1540 FORCP=0TOCD-1:PRINT"
        {DOWN}";:NEXTCP
XC 1550 IFCR>0THENPRINTTAB(CR)
RC 1560 IFG=2ANDRV=1ANDK+O=>GS
        THENPRINT"{RVS}{8}"Q$M
        ID$(Z$(K+O),MB,ME)Q$"
        {OFF}":GOTO1590
GM 1570 IFRV=1THENPRINT"{RVS}"
        CC$Q$MID$(Z$(K+O),MB,M
        E)Q$"{OFF}";:GOTO1590
JE 1580 PRINT"{YEL}"Q$MID$(Z$(
        K+O),MB,ME)Q$;
GF 1590 IFG=1THENRETURN
CF 1600 RV=0:RETURN
HF 1610 CC$="{3}":GS=K+O:GF=GS
        :RV=1:GOSUB1410
JQ 1620 GETDG$:IFDG$=""THEN162
        0
KD 1630 IFK+O=GSANDDG$="{UP}"T
        HEN1620
GQ 1640 IFO=0ANDDG$="{UP}"ANDG
        S<K+OTHEN1670
QK 1650 IFDG$="{UP}"THENRV=0:G
        OSUB1410:RV=1:O=O-1:GF
        =K+O:GOSUB1410:GOTO162
        0
RB 1660 GOTO1690
RR 1670 IFOM>1THENK=K-48:O=47:
        A$="GB":GOSUB670:A$=""
DE 1680 IFOM=1THENK=K-96:O=95:
        A$="GB":GOSUB 670:A$="
        "
QM 1690 IFK+O=VANDDG$="{DOWN}"
        THEN1620
MK 1700 IFDG$="{DOWN}"ANDO<JJ-
        1THEN1730
JG 1710 IFDG$="{DOWN}"ANDOM>1T
        HENK=K+48:O=0:A$="PS":
        GOTO1070
KD 1720 IFDG$="{DOWN}"ANDOM=1T
        HENK=K+96:O=0:A$="PS":
        GOTO1070
QE 1730 IFDG$="{DOWN}"THENO=O+
        1:GF=K+O:GOSUB1410
HA 1740 IFDG$="G"THEN1780
QS 1750 IFDG$<>"C"THEN1620
PG 1760 PRINT"{CLR}{4 DOWN}"TA
        B(WD-16)"{YEL}FILE GRO
        UP CANCELED...PLEASE W
        AIT"
XR 1770 FORCA=0TO297:SG$(CA)="
        ":NEXTCA:RV=0:G=0:GS=0
        :A$="PS":CC$="{WHT}":G
        OTO1100
BS 1780 PRINT"{CLR}{4 DOWN}"TA
        B(WD-14)"{YEL}MOVING F
        ILES UP...PLEASE WAIT"
GB 1790 A=0:FORGA=GSTOGF:SG$(A
        )=Z$(GA):A=A+1:NEXTGA:
        GA=0:A=0
SM 1800 GT=GF-GS+1:FORMF=0TOV-
        GF:Z$(GS+MF)=Z$(GF+MF+
        1):NEXTMF
FX 1810 FORFL=VTOV-(GT-1)STEP-
        1:Z$(FL)="{3 SPACES}
        {Q}**************{W}
        {14 SPACES}":NEXTFL
CB 1820 FL=0:RV=0:O=0:CC$="{6}
        ":IFG=1THENG=2:GOTO670
SB 1830 IP=GS:PRINT"{CLR}
        {4 DOWN}"TAB(WD-16)"
        {YEL}FILE GROUP CANCEL
        ED...PLEASE WAIT":GOTO
        1850
RG 1840 PRINT"{CLR}{4 DOWN}"TA
        B(WD-14)"{YEL}INSERTIN
        G FILES...PLEASE WAIT"
        :IP=K+O
QB 1850 FORMF=0TOV-(IP+(GT-1))
        :Z$(V-MF)=Z$(V-GT-MF):
        NEXTMF
HF 1860 FORTF=0TOGT-1:Z$(IP+TF
        )=SG$(TF):NEXTTF:FOREG
        =0TO297:SG$(EG)="":NEX
        TEG
XE 1870 A$="PS":CC$="{WHT}":MF
        =0:TF=0:EG=0:GS=0:GF=0
        :GT=0:IP=0:G=0:GOTO108
        0
```

BEFORE TYPING . . .

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Financial Planner

Article on page 44.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XF 20 PRINTCHR$(147);CHR$(14);
      CHR$(8):POKE53281,0:POKE
      53280,11:POKE646,13
FM 30 PRINTSPC(12)"COPYRIGHT 1
      989":PRINT SPC(6)"COMPUT
      E! PUBLICATIONS, INC."
MC 40 PRINT SPC(10)"ALL RIGHTS
       RESERVED."
GG 50 SA=52224:IF PEEK(SA)=169
       AND PEEK(SA+206)=96 THE
      N CLR:GOTO250
JB 60 H1=INT((SA+13)/256):L1=(
      SA+13)-H1*256
PG 70 H2=INT((SA+150)/256):L2=
      (SA+150)-H2*256:CS=0
DM 80 FOR AD=SATOSA+206:READML
      :CS=CS+ML:POKEAD,ML:NEXT
SS 90 IF CS<>23175 THEN PRINT
      {SPACE}CHR$(147)"ERROR I
      N ML DATA":END
RC 100 POKE SA+5,L1:POKE SA+9,
       H1:POKE SA+133,L2:POKE
       {SPACE}SA+138,H2
PJ 110 SYS SA:CLR
FE 120 DATA 169,76,133,124,169
       ,13,133,125,169,192,133
       ,126,96,141,255,3
MS 130 DATA 104,141,252,3,104,
       141,253,3,72,173,252,3,
       72,201,217,208
MJ 140 DATA 7,173,253,3,201,18
       3,240,11,173,255,3,201,
       58,176,3,76
KP 150 DATA 128,0,96,104,169,2
       20,72,186,142,254,3,165
       ,113,141,248,3
BS 160 DATA 165,114,141,249,3,
```

```
        162,79,189,0,2,157,167,
        3,202,16,247
FR 170  DATA 56,165,36,229,122,
        168,162,23,201,81,176,7
        3,169,0,141,13
XR 180  DATA 3,153,0,2,136,177,
        122,153,0,2,136,16,248,
        169,0,133
AH 190  DATA 122,169,2,133,123,
        32,121,165,173,0,3,141,
        250,3,173,1
EJ 200  DATA 3,141,251,3,169,15
        0,141,0,3,169,192,141,1
        ,3,32,115
AR 210  DATA 0,32,138,173,162,0
        ,173,250,3,141,0,3,173,
        251,3,141
HE 220  DATA 1,3,173,13,3,138,1
        41,13,3,240,6,169,0,133
        ,97,133
MA 230  DATA 102,173,248,3,133,
        113,173,249,3,133,114,1
        62,79,189,167,3
QJ 240  DATA 157,0,2,202,16,247
        ,169,0,133,13,174,254,3
        ,154,96,0
RK 250  DN$="{DOWN}":LT$="
        {RIGHT}":SP$=" ":DC$=DN
        $:HD$="{HOME}{DOWN}":HR
        $=HD$+"{RVS}":H$="
        {HOME}":R$="{RVS}"
KG 260  CD$="{CLR}{DOWN}":C2$=C
        D$+DC$:U$="{UP}":U3$=U$
        +U$+U$:ER$=" "+R$+"ERRO
        R"
JK 270  FOR I=1 TO 6:DN$=DN$+DN
        $:LT$=LT$+LT$:SP$=SP$+S
        P$:NEXT
BG 280  DN$=LEFT$(DN$,24):LT$=L
        EFT$(LT$,40):SP$=LEFT$(
        SP$,39)
MF 290  DIM C%(255),FC$(22),FC%
        (22),FV(22),V2(22),ZF(2
        2):PRINTCHR$(14)
FF 300  DIM CF(50),CP(50),CW(50
        ),A(50),W(50),P(50),Q(5
        0),I2(50),W2(50),TP(39)
EP 310  POKE 784,108:POKE785,12
        2:POKE786,0
EH 320  DEF FN RS(LN)=USR(LN)+P
        OS(" {A}{U} {T}{2 £}F<
        {G}<L'{£}")
FD 330  T=FN RS(360)
FG 340  FOR K=1 TO 12:READ A:C%
        (A)=K:NEXT
PE 350  FOR K=49 TO 58:C%(K)=10
        :NEXT:C%(17)=5:C%(32)=7
KK 360  DATA 67,95,133,134,13,1
        45,147,20,46,48,89,78
QS 370  POKE 784,108:POKE785,12
        2:POKE786,0
SK 380  DEF FN R2(RR)=INT(AN/RR
        +.5)*RR
JA 390  DEF FN RD(RR)=INT(RR*10
        0+.5)/100
HJ 400  PRINTCD$
MD 410  PRINTHD$;DC$"FINANCIAL
        {SPACE}PLANNER";DC$:PRI
        NT"PRESS # OF OPTION";D
        C$
MA 420  PRINT"1. COLLEGE PLANNI
        NG"
FX 430  PRINT"2. CAR BUY/LEASE"
QB 440  PRINT"3. COMPOUND INTER
        EST/SAVINGS"
SS 450  PRINT"4. LOAN PAYMENTS"
RS 460  PRINT"5. FIXED/ADJUSTAB
        LE RATE MORTGAGE"
QH 470  PRINT"6. HOW MUCH LIFE
        {SPACE}INSURANCE DO YOU
         NEED?"
MK 480  PRINT"7. SHOULD YOU REF
        INANCE YOUR MORTGAGE?"
PS 490  PRINT"8. IRA
        {SHIFT-SPACE}PLANNING":
        AF=0
MA 500  GETA$:IF A$="" THEN500
PG 510  C=C%(ASC(A$)):IF C=1 TH
        EN GOSUB930:GOTO410
MD 520  IF C=2 THEN PRINTCHR$(1
        47):END
RF 530  IF C<>10 THEN400
SM 540  PRINTDC$;R$"READING DAT
        A STATEMENTS ..."
MM 550  ON VAL(A$) GOTO2000,300
        0,4000,5000,6000,7000,8
        000,9000
GF 560  GOTO400
FH 570  REM--
XK 580  FOR I=0 TO NR:PRINTFC$(
        I);:GOSUB820:NEXT:RETUR
        N
GK 590  REM PRINT SCREEN SUBROU
        TINE
KB 600  RR=1104:PX=0:PY=0:MY=22
        :FOR TY=22 TO 10 STEP-1
QD 610  IF PEEK(RR+TY*40)<>32 O
        R PEEK(RR+TY*40+1)<>32
        {SPACE}THEN MY=TY:TY=10
SX 620  NEXT:GOSUB1940:GOSUB720
        :IF T<0 THEN710
KQ 630  PRINTHR$"PRINTING ...":
        OPEN7,4,7
SE 640  FOR I=0 TO MY:T$=DC$:H=
        -2
CX 650  FOR J=0 TO 39:A=PEEK(RR
        +I*40+J) AND 127:IF A=9
        6 THEN A=32:GOTO690
FM 660  IF A>0 AND A<27 THEN A=
        A+64:GOTO680
XG 670  IF A>64 AND A<91 THEN A
        =A+128
GQ 680  IF A<>32 THEN H=J
KE 690  T$=T$+CHR$(A):NEXT
HH 700  T$=LEFT$(T$,H+2):PRINT#
        7,T$:NEXT:CLOSE7
GG 710  GOSUB1950:RETURN
SS 720  OPEN7,4,7:CLOSE7:T=ST
JD 730  OPEN7,4:IF ST=T THEN CL
        OSE7:RETURN
GQ 740  PRINTHD$SP$:PRINTU$"PRI
        NTER NOT READY, PRESS <
         TO CANCEL"
PE 750  GETA$:IF A$="<" THEN T=
        -1:CLOSE7:RETURN
PH 760  IF A$="" THEN T=T+1:IF
        {SPACE}T<9 THEN750
XD 770  T=0:PRINTHD$;SP$:CLOSE7
        :GOTO720
XH 780  GOSUB1070:IF QA=2 THEN
        {SPACE}RETURN
RS 790  T$=T2$
SM 800  PRINTH$;LEFT$(DN$,CY+2)
        ;FC$(CY);TAB(LC-9);LEFT
        $(SP$,9)
HM 810  PRINTH$;LEFT$(DN$,CY+2)
        ;FC$(CY);:I=CY
FG 820  IF FC%(I)=0 THEN PRINT:
        RETURN
BF 830  ON FC%(I) GOSUB850,880,
        890,910
HG 840  PRINT TAB(LC-LEN(T$)-(1
        =FC%(I)));T$:RETURN
ME 850  IF SF=0 THEN T$=MID$(ST
        R$(FV(I)),2,6)+"%":RETU
        RN
QD 860  T$=T2$+"%":IF T2$="" TH
        EN T$="0%"
GQ 870  RETURN
GE 880  T$="$"+MID$(STR$(INT(FV
        (I)+.5)),2):RETURN
HG 890  T$="NO":IF FV(I) THEN T
        $="YES"
HX 900  RETURN
KM 910  T$=MID$(STR$(INT(FV(I))
        ),2):RETURN
QP 920  REM CALCULATOR SUBROUTI
        NE
GK 930  PRINTH$;SP$
QB 940  T=0:A2$="":T$=HD$+SP$+"
        {UP}":PRINTT$:IF CC$<>"
        " THEN A2$=STR$(VAL(CC$
        ))
KD 950  PRINTT$:FOR T2=0 TO T:N
        EXT:PRINT"?"A2$
DM 960  GETA$:IF A$<>"" THEN990
SS 970  T=T+1:IF T>199 THEN T=0
        :GOTO950
CH 980  GOTO960
EA 990  T=0:A=ASC(A$):IF A=13 T
        HEN CC$=A2$:GOTO930
AG 1000 IF(A>38 AND A<58 AND A
        <>44) OR A=94 THEN A2$
        =LEFT$(A2$+A$,38):GOTO
        950
SS 1010 IF A=95 OR A=67 THEN P
        RINTH$;SP$:PRINTSP$:RE
        TURN
DR 1020 IF A=20 THEN IF LEN(A2
        $) THEN A2$=LEFT$(A2$,
        LEN(A2$)-1):GOTO950
RF 1030 IF A=147 OR A=19 THEN
        {SPACE}A2$="":GOTO950
GS 1040 IF A<>81 AND A<>69 AND
         A<>61 THEN960
EK 1050 PRINT T$;H$;SP$:IF LEN
        (CC$)<21 THEN PRINTH$;
        CC$" =";
GS 1060 PRINTVAL(CC$):RETURN
QE 1070 IF FC%(CY)<>0 THEN1100
DP 1080 SF=0:GF=0:GOSUB1420:CY
        =CY+1:IF CY>NR THEN CY
        =0
DG 1090 GOTO1070
CA 1100 IF SF=0 THEN T2$=MID$(
        STR$(FV(CY)),2):SF=1
GJ 1110 PRINTH$;LEFT$(DN$,CY+2
        );R$;:I=CY:GOSUB820:QA
        =3
XK 1120 GETA$:IF A$="" THEN112
        0
EX 1130 A=ASC(A$)
GB 1140 ON C%(A) GOTO1160,1170
        ,1180,1120,1190,1230,1
        270,1290,1370,1400,133
        0,1350
QG 1150 GOTO1120
KP 1160 GOSUB930:GOTO1120
MH 1170 QA=1:RETURN
RJ 1180 QA=2:GOSUB1770:RETURN
RQ 1190 IF A<>17 AND A<>13 THE
        N1230
SK 1200 GOSUB800:GF=0:GOSUB142
        0:CY=CY+1:SF=0:IF CY>N
        R THEN CY=0
AM 1210 IF FC%(CY)=0 THEN1200
RR 1220 RETURN
XM 1230 GOSUB800
FF 1240 GF=0:GOSUB1420:CY=CY-1
        :SF=0:IF CY<0 THEN CY=
        NR
FD 1250 IF FC%(CY)=0 THEN1240
KS 1260 RETURN
BF 1270 IF A=147 OR (A=32 AND
        {SPACE}FC%(CY)<>3) THE
        N T2$="":FV(CY)=0:RETU
        RN
QA 1280 GOTO1320
DF 1290 IF LEN(T2$)<2 THEN T2$
        ="":FV(CY)=0:RETURN
PS 1300 T2$=LEFT$(T2$,LEN(T2$)
        -1):FV(CY)=VAL(T2$):RE
        TURN
HF 1310 REM
FD 1320 FV(CY)=1-FV(CY):RETURN
GJ 1330 IF FC%(CY)=3 THEN FV(C
        Y)=1
QF 1340 RETURN
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BJ 1350 IF FC%(CY)=3 THEN FV(C
        Y)=0
GH 1360 RETURN
BD 1370 IF FC%(CY)<>1 THEN RET
        URN
PQ 1380 FOR J=1 TO LEN(T2$):IF
         MID$(T2$,J,1)=CHR$(46
        ) THEN J=7:NEXT:RETURN
EC 1390 NEXT J
KH 1400 IF GF=0 THEN GF=1:T2$=
        A$:FV(CY)=VAL(T2$):RET
        URN
FH 1410 T2$=LEFT$(T2$+A$,7):FV
        (CY)=VAL(T2$):RETURN
GQ 1420 IF FC%(CY)=0 THEN RETU
        RN
KK 1430 IF FC%(CY)<>1 THEN1500
CP 1440 T$=HD$+SP$+HD$+"WARNIN
        G - % RATE "
HS 1450 IF FV(CY)>100 THEN PRI
        NTT$;"GREATER THAN 100
        ":RETURN
XH 1460 IF FV(CY)=0 THEN PRINT
        T$;"IS ZERO":RETURN
BM 1470 IF V2(CY)>0 AND FV(CY)
        >V2(CY)*2+4 THEN PRINT
        T$;"VERY HIGH":RETURN
DJ 1480 IF V2(CY)>0 AND FV(CY)
        <.1 THEN PRINTT$"VERY
        {SPACE}LOW":RETURN
GA 1490 GOTO1540
BR 1500 IF FC%(CY)<>4 THEN1540
XM 1510 T$=HD$+SP$+HD$+"WARNIN
        G - # IS{SHIFT-SPACE}"
DQ 1520 IF FV(CY)=0 THENPRINTT
        $;"ZERO":RETURN
QH 1530 IF V2(CY)>0 AND FV(CY)
        >V2(CY) THENPRINTT$;"E
        XTREMELY LARGE":RETURN
AE 1540 PRINTHD$;SP$:RETURN
EK 1550 IF QT=ZT THEN RETURN
KF 1560 QT=ZT:T=FN RS(ZT):I=0
XX 1570 ZF(I)=0:READ FC$(I):IF
         FC$(I)="E" THEN NR=I-
        1:RETURN
SG 1580 IF FC$(I)<>"IR" THEN16
        00
XP 1590 FC$(I)="INFLATION RATE
        ":FC%(I)=1:FV(I)=4.4:V
        2(I)=5:GOTO1630
XQ 1600 V2(I)=-1:READ FC%(I):I
        F FC%(I) THEN READ FV(
        I):V2(I)=FV(I)
JS 1610 IF FC%(I)=4 OR FC%(I)=
        1 THEN READ ZF(I)
KA 1620 IF FC%(I)=4 THEN READ
        {SPACE}V2(I)
XD 1630 I=I+1:GOTO1570
GR 1640 R4=12:GOTO1660
RM 1650 R4=7
EP 1660 T$="$"+MID$(STR$(INT(R
        R+.5)),2):PRINTLEFT$(S
        P$,R4-LEN(T$));T$;:RET
        URN
GD 1670 PRINT"$"MID$(STR$(INT(
        RR+.5)),2);:RETURN
QS 1680 AN$="$"+MID$(STR$(AN),
        2)
ER 1690 IF AN=INT(AN) THEN AN$
        =AN$+".00":RETURN
RS 1700 IF ABS(AN*10-INT(AN*10
        +.5))<.001 THEN AN$=AN
        $+"0"
QM 1710 RETURN
PR 1720 PRINT:PRINT"CHANGE ANY
         OR ALL VALUES, THEN M
        OVE"
PX 1730 PRINT"CURSOR TO THE NU
        MBER YOU WANT"
QA 1740 PRINT"CALCULATED AND P
        RESS F1."
BF 1750 CY=2:SF=0:RETURN
RE 1760 AN=FN RD(AN):GOSUB1680
        :PRINTLEFT$(SP$,11-LEN
        (AN$));AN$;:RETURN
CF 1770 PRINTH$;LEFT$(DN$,NR+4
        );:FOR RR=NR+4 TO 23:P
        RINTSP$:NEXT
MR 1780 PRINT H$;LEFT$(DN$,NR+
        4):IF AF=1 THEN FV(CY)
        =.01
RM 1790 FOR K=2 TO NR:IF ZF(K)
        =0 OR FV(K)>00 THEN182
        0
PP 1800 PRINTFC$(K)" = 0";ER$:
        K=NR:QA=3
XB 1810 PRINT" CHANGE VALUE TH
        EN F1 CALC, < MENU"
CB 1820 NEXT:IF QA=3 THEN RETU
        RN
GF 1830 PRINT H$;LEFT$(DN$,NR+
        4);R$"CALCULATING..."U
        $:SF=0:RETURN
CG 1840 PRINT:PRINT"ENTER ALL
        {SPACE}VALUES THEN PRE
        SS F1 TO CALC":CY=2:SF
        =0:RETURN
SM 1850 PRINTHR$U$"PRESS F5 ";
        T$:PF=-1
RQ 1860 PRINTHR$"PRESS F1 ANOT
        HER, F3 PRINT, < MENU"
        :GF=0
HM 1870 GETA$:IF A$="" THEN187
        0
HS 1880 A=ASC(A$):IF A=67 THEN
         GOSUB1940:GOSUB930:GO
        SUB1950:GOTO1870
CE 1890 IF PF<0 AND A=135 THEN
         RA=4:GOTO1920
SS 1900 IF C%(A)>4 THEN1870
EB 1910 RA=C%(A)-1:IF RA<1 OR
        {SPACE}RA>3 THEN1870
QC 1920 IF PF<0 THEN PRINTH$;S
        P$:PF=0
MQ 1930 PRINTHD$;SP$:RETURN
SC 1940 FOR K=0 TO 39:TP(K)=PE
        EK(1064+K):NEXT:RETURN
XX 1950 FOR K=0 TO 39:POKE 106
        4+K,TP(K):NEXT:RETURN
AB 2000 REM--
GC 2010 DATA "COLLEGE PLANNING
        ",0," ",0
JQ 2020 DATA "TODAY'S ANNUAL C
        OST",2,11500
MR 2030 DATA IR
AE 2040 DATA "YEARS UNTIL COLL
        EGE",4,12,1,18
BE 2050 DATA "# YEARS IN COLL
        GE",4,4,1,8," ",0
BC 2060 DATA "PRESENT SAVINGS"
        ,2,8500
GR 2070 DATA "AFTER TAX YIELD
        {SPACE}",1,7.35,1
GM 2080 DATA E
XE 2090 ZT=2000:LC=28:GOSUB155
        0
KS 2100 PRINTCD$:SF=0
AE 2110 GOSUB580
RX 2120 GOSUB1840
CK 2130 GOSUB780
AK 2140 ON QA GOTO400,2150,213
        0
CJ 2150 IF FV(4)=0 OR FV(5)=0
        {SPACE}THEN AN=FV(CY):
        PRINT"# YEARS 0"+ER$:G
        OTO2330
GC 2160 T2=0:T3=0:T4=0:RI=1+(F
        V(8)-FV(3))/100:R3=1+F
        V(3)/100:R8=1+FV(8)/10
        0
BX 2170 FOR I=FV(4) TO FV(4)+F
        V(5)-1
XE 2180 T2=T2+FV(2)/RI↑I
AF 2190 T3=T3+R3↑FV(4)/(RI↑(I-
        FV(4)))
BC 2200 T4=T4+R3↑I*FV(2)
KA 2210 NEXT I:T3=T3*FV(2)-FV(
        7)*R8↑FV(4)
BE 2220 PRINT"TOTAL COLLEGE CO
        STS WILL BE $";INT(T4+
        .5):PRINT
HF 2230 IF FV(8)=0 THEN AN=T3/
        FV(4):GOTO2250
AA 2240 AN=T3*FV(8)/100/(R8↑FV
        (4)-1)
RQ 2250 IF AN>0 THEN2280
AQ 2260 RR=FV(7)-T2:PRINT"SAVI
        NGS EXCEED NEEDS BY ";
        :GOSUB1670
QB 2270 PRINT".":Q2=0:GOTO2330
CF 2280 PRINT"YOU NEED TO SAVE
         $"FN R2(25)"EVERY YEA
        R"
QQ 2290 PRINT"FOR THE NEXT";FV
        (4)"YEARS":AN=T2-FV(7)
MC 2300 PRINT"OR SET ASIDE AN
        {SPACE}ADDITIONAL $";F
        N R2(500)
KB 2310 PRINT"TODAY TO PAY FOR
         COLLEGE."
MB 2320 AN=AN+FV(7):Q2=FN R2(5
        00)
BR 2330 GOSUB1860:ON RA GOTO40
        0,2100
QG 2340 GOSUB600:GOTO2330
SX 3000 REM--
MA 3010 DATA "CAR BUY/LEASE",0
GF 3020 DATA " ",0
GG 3030 DATA IR," ",0
QE 3040 DATA "--BUY--",0
XA 3050 DATA "PRICE OF CAR",2,
        12500
XR 3060 DATA " FINANCING",3,1
HX 3070 DATA "{2 SPACES}TRADE
        {SPACE}IN/DOWN PAYMENT
        ",2,2000
HF 3080 DATA "{2 SPACES}ANNUAL
         % RATE",1,12,1
CE 3090 DATA "{2 SPACES}# OF M
        ONTHLY PAYMENTS",4,60,
        1,84,"--LEASE--",0
PE 3100 DATA " REFUNDABLE SECU
        RITY DEP",2,250
SC 3110 DATA " INITIAL PAYMENT
        ",2,378
HF 3120 DATA " MONTHLY PAYMENT
        ",2,189
GB 3130 DATA " # OF PAYMENTS",
        4,60,0,84
DD 3140 DATA " BUY OUT PRICE",
        2,6200
MQ 3150 DATA E
DK 3160 ZT=3000:LC=31:GOSUB155
        0
JD 3170 PRINTCD$:SF=0
AJ 3180 GOSUB580
GA 3190 GOSUB1840
BF 3200 PRINT:PRINT"YEARS TO M
        ONTHS: 3/36, 4/48, 5/6
        0"
BM 3210 GOSUB780
SF 3220 ON QA GOTO400,3230,321
        0
RR 3230 IF FV(6)=0 THEN TC=FV(
        5):GOTO3280
JM 3240 TC=FV(7):I=FV(8)/100:R
        2=(1+FV(2)/100)↑(1/12)
        :P=FV(5)-FV(7)
CH 3250 EP=(I*P/12)/(1-1/(I/12
        +1)↑(12*FV(9)/12))
XJ 3260 FOR J=1 TO FV(9)
KX 3270 TC=TC+EP/(R2↑J):NEXT
AD 3280 T2=FV(12):RI=(1+FV(2)/
        100)↑(1/12):T2=T2+FV(1
        1)-FV(11)/RI↑FV(14)
HD 3290 FOR J=1 TO FV(14)
RC 3300 T2=T2+FV(13)/RI↑J:NEXT
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        :T2=T2+FV(15)/RI↑FV(14
        )
BJ 3310 PRINT"TOTAL COSTS FOR
        {SPACE}BUYING: $";:IF
        {SPACE}FV(6)=0 THEN PR
        INTFV(5):GOTO3330
QA 3320 PRINT INT(EP*FV(9)+FV(
        7)+.5)
JF 3330 PRINT SPC(15)"LEASING:
         $";INT(FV(13)*FV(14)+
        FV(12)+FV(15)+.5)
HE 3340 PRINT"REAL COSTS, AFTE
        R INFLATION ADJUSTMENT
        "
KM 3350 PRINT SPC(16)"BUYING:
        {SPACE}$";INT(TC+.5)
PJ 3360 PRINT SPC(15)"LEASING:
         $";INT(T2+.5)
ED 3370 IF FV(6)=0 THEN3390
DX 3380 PRINT" MONTHLY PAYMENT
        S IF FINANCED: $";INT(
        EP+.5);H$
XP 3390 GOSUB1860:ON RA GOTO40
        0,3170
HK 3400 GOSUB600:GOTO3390
RQ 4000 REM--
GC 4010 DATA "COMPOUND INTERES
        T/SAVINGS",0," ",0
AR 4020 DATA "PRESENT VALUE",2
        ,2915
FK 4030 DATA "MONTHLY ADDITION
        ",2,35
HC 4040 DATA "ANNUAL YIELD",1,
        6.29,0
MQ 4050 DATA "# OF YEARS",4,9,
        0,49
CP 4060 DATA "FUTURE VALUE",2,
        10000
BG 4070 DATA E
EM 4080 ZT=4000:LC=25:GOSUB155
        0
AH 4090 PRINTCD$:SF=0:AF=1
DA 4100 GOSUB580
HM 4110 GOSUB1720
RG 4120 GOSUB780
AK 4130 ON QA GOTO400,4140,412
        0
QB 4140 PV=FV(2):R=FV(3):N=12:
        RI=(1+FV(4)/100)↑(1/12
        ):I=1-RI:Y=FV(5):T=FV(
        6)
RF 4150 NY=Y*12:T2=PV*RI↑NY:T=
        T-T2:RN=RI↑NY:IN=FV(4)
        /1200
CA 4160 ON CY-1 GOTO4170,4190,
        4250,4360,4420
AM 4170 T4=0:FOR K=0 TO Y*12-1
        :T4=T4+R*RI↑K:NEXT
RP 4180 AN=(FV(6)-T4)/RN:AN=IN
        T(AN+.5):GOTO4440
CF 4190 IF RI=1 THEN AN=(FV(6)
        -PV)/NY:GOTO4210
MH 4200 T5=(FV(6)-PV*RN)*(RI-1
        )/(RN-1):AN=T5
BQ 4210 AN$=MID$(STR$(INT(AN*1
        00-INT(AN)*100)),2)
BC 4220 IF LEN(AN$)=1 THEN AN$
        ="0"+AN$
DS 4230 AN$="$"+STR$(INT(AN))+
        "."+AN$
HA 4240 AN=INT(AN+.5):GOTO4470
BJ 4250 AN=10:DA=4.95:G=0:A4=5
        00
KM 4260 IF NY*R+PV<=0 THEN4450
DX 4270 IF FV(6)<NY*R+PV THEN4
        460
JA 4280 RI=(1+AN/100)↑(1/12):R
        N=RI↑NY:IF A4>10 THEN
        {SPACE}A4=INT(A4*.9)
RG 4290 G2=PV*RN+R*(RN-1)/(RI-
        1):IF INT(G2*A4+.5)=FV
        (6)*A4 THEN4350
SB 4300 IF G2<FV(6) THEN4330
SJ 4310 AN=AN-DA:IF G=1 THEN D
        A=DA/2
HD 4320 G=-1:GOTO4280
XM 4330 AN=AN+DA:IF G=-1 THEN
        {SPACE}DA=DA/2
SF 4340 G=1:GOTO4280
SF 4350 AN=FN R2(.001):AN$=STR
        $(AN)+"%":GOTO4470
CA 4360 IF NY*R+PV<=0 THEN4450
CH 4370 IF FV(6)<NY*R+PV THEN4
        460
HG 4380 IF RI=1 THEN AN=(FV(6)
        -PV)/R/12:GOTO4410
BP 4390 Z=RI-1:AN=(FV(6)*Z+R)/
        (Z*PV+R)
XJ 4400 AN=LOG(AN)/LOG(RI):AN=
        AN/12
RP 4410 AN=FN R2(.1):AN$=STR$(
        AN)+" YEARS":GOTO4470
AH 4420 IF RI=1 THEN AN=PV+R*N
        Y:GOTO4440
SE 4430 AN=PV*RN+R*(RN-1)/(RI-
        1)
HC 4440 AN=INT(AN+.5):AN$="$"+
        STR$(AN):GOTO4470
HX 4450 AN=FV(CY):AN$="$ VALUE
         0"+ER$:GOTO4470
HH 4460 AN=FV(CY):AN$="NEGATIV
        E RESULT"+ER$
QC 4470 FV(CY)=AN:GOSUB800
AK 4480 PRINTH$;LEFT$(DN$,NR+3
        )
QR 4490 PRINTSP$:PRINTSP$:PRIN
        TSP$:PRINTSP$
GE 4500 PRINTU3$" CALCULATED "
        FC$(CY):PRINT" IS :"AN
        $
MQ 4510 GOSUB1860:ON RA GOTO40
        0,4090
MK 4520 GOSUB600:GOTO4510
AM 5000 REM--
CA 5010 DATA "LOAN PAYMENTS",0
        ," ",0
DA 5020 DATA "AMOUNT OF LOAN",
        2,21003
ES 5030 DATA "INTEREST RATE",1
        ,11.89,0
RC 5040 DATA "# OF MONTHLY PAY
        MENTS",4,120,1,600
FJ 5050 DATA "MONTHLY PAYMENT"
        ,2,300
KE 5060 DATA E
DA 5070 ZT=5000:LC=30:GOSUB155
        0
JE 5080 PRINTCD$:SF=0:AF=1
XD 5090 GOSUB580
HH 5100 GOSUB1720
RA 5110 GOSUB780
EQ 5120 ON QA GOTO400,5130,511
        0
GQ 5130 P=FV(2):R=FV(5):RI=(1+
        FV(3)/100)↑(1/12):I=1-
        RI:NY=FV(4):N=12:RN=RI
        ↑NY
HX 5140 I2=FV(3)/100:I3=I2/N+1
QS 5150 IF NY=0 AND CY<>4 THEN
        T=4:GOTO5390
EH 5160 IF FV(5)=0 AND CY<>5 T
        HEN T=5:GOTO5390
JQ 5170 IF FV(2)=0 AND CY<>2 T
        HEN T=2:GOTO5390
XK 5180 IF P>R*NY AND CY=3 THE
        NAN=FV(CY):AN$="NEGATI
        VE RESULT"+ER$:GOTO541
        0
AS 5190 ON CY-1 GOTO5200,5230,
        5320,5360
AJ 5200 IF I3=1 THEN AN=R*NY:G
        OTO5220
HP 5210 AN=R*N*(1-1/I3↑NY)/I2
EB 5220 AN=INT(AN+.5):AN$="$"+
        STR$(AN):GOTO5410
EK 5230 SF=0:AN=10:DA=4.95:G=0
        :IF R*NY=P THEN AN=0:G
        OTO5310
MK 5240 I2=AN/100:I3=I2/N+1
PC 5250 G2=(I2*P/N)/(1-1/I3↑NY
        ):IF INT(G2*50+.5)=R*5
        0 THEN5310
AP 5260 IF G2<R THEN5290
FE 5270 AN=AN-DA:IF G=1 THEN D
        A=DA/2
KK 5280 G=-1:GOTO5240
PH 5290 AN=AN+DA:IF G=-1 THEN
        {SPACE}DA=DA/2
BQ 5300 G=1:GOTO5240
AH 5310 AN=FN R2(.001):AN$=STR
        $(AN)+"%":GOTO5410
SH 5320 IF I3=1 THEN AN=P/R:GO
        TO5350
HK 5330 IF R<P*I3-P THEN AN$="
        MONTHLY PAYMENT TOO SM
        ALL"+ER$:AN=FV(CY):GOT
        O5410
GB 5340 AN=LOG(-1/(P*I2/R/N-1)
        )/LOG(I3)
BF 5350 AN=INT(AN+.5):AN$=STR$
        (AN):GOTO5410
JE 5360 IF I3=1 THEN AN=P/NY:G
        OTO5380
KP 5370 AN=(I2*P/N)/(1-1/I3↑NY
        )
QK 5380 AN=FN RD(AN):GOSUB1680
        :GOTO5410
FC 5390 AN=FV(CY):AN$=FC$(T)
KM 5400 AN$=AN$+" = 0"+ER$
RE 5410 FV(CY)=AN:GOSUB800
KX 5420 PRINTH$;LEFT$(DN$,NR+3
        )
QD 5430 PRINTSP$:PRINTSP$:PRIN
        TSP$:PRINTSP$
PB 5440 PRINTU3$" CALCULATED "
        FC$(CY):PRINT" IS :"AN
        $
AF 5450 PRINT:T$="TO PRINT PAY
        MENT SCHEDULE"
FR 5460 GOSUB1850:ON RA GOTO40
        0,5080,5470,5480
PM 5470 GOSUB600:GOTO5450
MH 5480 PRINTCD$"ENTER DATE OF
         FIRST PAYMENT (< CANC
        EL)":INPUT" MONTH (1-1
        2)";M$
SK 5490 IF M$="<" THEN5080
FK 5500 M=INT(VAL(M$)):IF M<1
        {SPACE}OR M>12 THEN548
        0
RR 5510 INPUT" YEAR";YR$:YR=IN
        T(VAL(YR$)):IF YR>100
        {SPACE}THEN YR=YR-INT(
        YR/100)*100
PG 5520 GOSUB720:IF T<0 THEN50
        80
MB 5530 PRINT"PRINTING PAYMENT
         SCHEDULE..."
AJ 5540 OPEN4,4:CMD4
QH 5550 AN=FV(2):GOSUB1760:PRI
        NTDC$" BORROWED AT "FV
        (3)"%":AN=FV(5)
PK 5560 PRINT:PRINTDC$"
        {3 SPACES}#{3 SPACES}D
        ATE{3 SPACES}PRINCIPAL
        {3 SPACES}INTEREST
        {2 SPACES}BALANCE DUE"
BG 5570 P=FV(2):A=FV(5):RI=FV(
        3)/1200:IF FV(4)=1 THE
        N5690
JM 5580 FOR K=1 TO FV(4)
KM 5590 IF K<100 THEN PRINT" "
        ;:IF K<10 THEN PRINT"
        {SPACE}";
XA 5600 PRINTK;
EJ 5610 T$=DC$+STR$(M)+"/":IF
        {SPACE}YR<10 THEN T$=T
        $+"0"
FC 5620 T$=T$+MID$(STR$(YR),2)
```

```
      :PRINTLEFT$(SP$,7-LEN(
      T$));T$;
AF 5630 M=M+1:IF M>12 THEN M=1
      :YR=YR+1:IF YR>99 THEN
       YR=0
MQ 5640 IF K=FV(4) THEN NEXT:G
      OTO5690
KA 5650 T=P*RI:AN=A-T:GOSUB176
      0
RM 5660 AN=T:GOSUB1760:PRINT"
      {SPACE}";
HQ 5670 P=P-A+T:AN=P:GOSUB1760
      :PRINT
FE 5680 NEXT
EH 5690 T=P*RI:AN=P:GOSUB1760
SR 5700 AN=T:GOSUB1760:AN=0:GO
      SUB1760
BE 5710 AN=FV(5):PRINT:PRINTDC
      $" REGULAR PAYMENTS:";
      :GOSUB1760:PRINT
BS 5720 AN=P+T:PRINTDC$" LAST
      {SPACE}PAYMENT:";:GOSU
      B1760
XG 5730 PRINT#4:CLOSE4
AX 5740 PRINT"PRESS F1, F3 TO
      {SPACE}GO BACK TO LOAN
      S, < MENU"
EQ 5750 GOSUB1870:ON RA GOTO40
      0,5080,5080
HJ 6000 REM--
SF 6010 DATA "FIXED RATE OR AD
      JUSTABLE RATE MORTGAGE
      ",0," ",0
AH 6020 DATA "PRINCIPAL",2,860
      00
CD 6030 DATA "FIXED RATE MORTG
      AGE",0
BB 6040 DATA " ANNUAL % RATE",
      1,10.86,1
SX 6050 DATA " POINTS",1,3,0
RB 6060 DATA " # OF YEARS",4,3
      0,1,40
CE 6070 DATA "ADJUSTABLE RATE
      {SPACE}MORTGAGE",0
DR 6080 DATA " INITIAL INTERES
      T RATE",1,8.93,1
KK 6090 DATA " POINTS",1,2,0
SE 6100 DATA " YEARLY CAP",1,2
      ,1
BP 6110 DATA " LIFETIME CAP",1
      ,14,1
PS 6120 DATA " # OF YEARS",4,3
      0,1,40
AF 6130 DATA " ",0
FQ 6140 DATA IR
PP 6150 DATA E
FQ 6160 ZT=6000:LC=30:GOSUB155
      0
HR 6170 PRINTCD$:SF=0:GOSUB580
XX 6180 GOSUB1840
AF 6190 GOSUB780
PX 6200 ON QA GOTO400,6210,619
      0
JJ 6210 N=12:I2=FV(4)/100:I3=I
      2/N+1:NY=FV(6)*12:P=FV
      (2):Y=FV(6):YY=FV(12)
AA 6220 A2=(I2*P/N)/(1-1/I3↑NY
      )
AM 6230 I2=FV(8)/100:I3=I2/N+1
      :NY=FV(12)*12
KG 6240 AN=(I2*P/N)/(1-1/I3↑NY
      ):A(0)=AN:W(0)=AN
FJ 6250 MX=FV(11)/100:D=FV(10)
      /100:P(0)=P:Q(0)=P:I2(
      0)=I2:W2(0)=I2
BG 6260 CF(0)=FV(5)/100*P:CP(0
      )=FV(10)/100*P:CW(0)=C
      P(0):NY=YY*12
AQ 6270 Y2=0:Y4=0:RI=1+FV(14)/
      100
MG 6280 FOR K=1 TO 5:GOSUB6810
      :NEXT
RD 6290 RR=A2:PRINT"FIXED RATE
       PAYMENTS ARE
      {SHIFT-SPACE}";:GOSUB1
      670:PRINT" A MONTH."
JB 6300 RR=AN:PRINT"ARM
      {SHIFT-SPACE}PAYMENTS
      {SPACE}START AT ";:GOS
      UB1670:PRINT".
      {2 SPACES}IF RATES"
SQ 6310 RR=A(2):PRINT"RISE .5%
       A YEAR, PAYMENTS BECO
      ME ";:GOSUB1670:PRINT
MG 6320 RR=A(5):PRINT"IN 2 YEA
      RS, AND ";:GOSUB1670:P
      RINT" IN 5 YEARS."
QR 6330 RR=W(2):PRINT"IN THE W
      ORST CASE, PAYMENTS AR
      E ";:GOSUB1670:PRINT
FB 6340 RR=W(5):PRINT"IN 2 YEA
      RS, AND ";:GOSUB1670:P
      RINT" IN 5 YEARS."
BE 6350 T$="FOR FURTHER ANALYS
      IS"
HH 6360 GOSUB1850:ON RA GOTO40
      0,6170,6370,6380
KD 6370 GOSUB600:GOTO6350
GD 6380 IF Y<6 THEN6410
FE 6390 TY=Y-1:IF YY>Y THEN TY
      =YY-1
QD 6400 GOSUB1770:FOR K=6 TO T
      Y+1:GOSUB6810:NEXT
GE 6410 PRINTCD$;DC$"ADJUSTABL
      E RATE MORTGAGES ARE G
      REAT"
KK 6420 PRINT"IF INTEREST RATE
      S GO DOWN, AND TERRIBL
      E"
SB 6430 PRINT"WHEN RATES SKYRO
      CKET.{2 SPACES}ARMS AR
      E ALSO"
RF 6440 PRINT"GOOD FOR PEOPLE
      {SPACE}WHO MOVE OFTEN.
      "
DD 6450 IFYY<>YTHENPRINT"COMPA
      RISONS INVALID BECAUSE
       LENGTHS{5 SPACES}DIFF
      ER.":GOTO6570
QS 6460 IF Y2>0 THEN6490
PP 6470 PRINT"THE FIXED RATE M
      ORTGAGE IS SUPERIOR. T
      HE";
PQ 6480 PRINT"ARM MAKES SENSE
      {SPACE}IF RATES GO DOW
      N.":GOTO6570
CK 6490 PRINT"IF INTEREST RATE
      S INCREASE .5% A YEAR"
GH 6500 PRINT"(A REALISTIC AND
       PESSIMISTIC SCENARIO)
      "
SG 6510 PRINT"AND YOU SELL WIT
      HIN"Y2"YEARS THE ARM":
      PRINT"IS BETTER.";
HK 6520 IF Y4=0 THEN6570
MG 6530 PRINT"{2 SPACES}IF RAT
      ES RISE QUICKLY (UP"
HP 6540 PRINT"YEARLY CAP EVERY
       YEAR), YOU STILL"
RD 6550 PRINT"COME OUT AHEAD I
      F SELL WITHIN"Y4
QS 6560 PRINT"YEARS."
RF 6570 PRINT:T$="TO PRINT COS
      T ANALYSIS TABLE"
KE 6580 GOSUB1850:ON RA GOTO40
      0,6170,6590,6610
SQ 6590 GOSUB600:GOTO6570
RQ 6600 IF A=95 THEN6170
XM 6610 GOSUB720:IF T=-1 THEN6
      170
JA 6620 OPEN4,4,7:CMD4
CE 6630 RR=A2:PRINTDC$"FIXED R
      ATE PAYMENTS ARE ";:GO
      SUB1670:PRINT
JJ 6640 IF FV(6)=FV(12) THEN66
      60
DK 6650 PRINTDC$"WARNING! COST
       COMPARISON INVALID BE
      CAUSE OF TERM DIFFEREN
      CE."
BP 6660 PRINT:PRINTDC$"CUMULAT
      IVE REAL COSTS AND MON
      THLY PAYMENTS":PRINT
HA 6670 PRINTDC$"YR{7 SPACES}F
      IXED{7 SPACES}RISING R
      ATES{7 SPACES}WORST CA
      SE"
JG 6680 PRINTDC$"{9 SPACES}COS
      TS{7 SPACES}COSTS
      {2 SPACES}PAYMENT
      {5 SPACES}COSTS PAYMEN
      T"
QE 6690 FOR K=0 TO TY
AE 6700 PRINTDC$;MID$(STR$(K),
      2);
AJ 6710 IF K<10 THEN PRINT"
      {SHIFT-SPACE}";
EB 6720 RR=CF(K):GOSUB1640:RR=
      CP(K):GOSUB1640:RR=A(K
      ):GOSUB1650
CR 6730 RR=CW(K):GOSUB1640:RR=
      W(K):GOSUB1650:PRINT:N
      EXT:IF Y<>YY THEN6780
KD 6740 PRINT:PRINTDC$"OVER TH
      E LIFE OF THE"Y"YEAR M
      ORTGAGE THE REAL COSTS
       ARE:"
CE 6750 RR=CF(TY+1):GOSUB1640:
      PRINTDC$" FOR THE FIXE
      D RATE MORTGAGE"
DJ 6760 RR=CP(TY+1):GOSUB1640:
      PRINTDC$" FOR THE ARM
      {SPACE}WITH RISING INT
      EREST RATES"
KK 6770 RR=CW(TY+1):GOSUB1640:
      PRINTDC$" FOR THE WORS
      T CASE ARM"
FQ 6780 PRINT#4:CLOSE4:PRINTCH
      R$(147)HR$"PRESS F1, F
      3 ANOTHER, < MENU":GOS
      UB1870
MF 6790 IF A=95 THEN400
JR 6800 GOTO6170
HP 6810 T=K-1:N4=NY-K*N
FR 6820 H=N/RI↑T:CF(K)=CF(T)+A
      2*H:CP(K)=CP(T)+A(T)*H
      :CW(K)=CW(T)+W(T)*H
PS 6830 IF CF(K)>CP(K) THEN Y2
      =K
RE 6840 IF CF(K)>CW(K) THEN Y4
      =K
JJ 6850 I2=I2(T)/12:W2=W2(T)/1
      2:P=P(T):Q=Q(T):A=A(T)
      :W=W(T)
QR 6860 FOR J=1 TO N
DG 6870 P=P+P*I2-A:Q=Q+Q*W2-W
QH 6880 NEXT J:Q(K)=Q:P(K)=P
MG 6890 I2(K)=I2(T)+.005:IF I2
      (K)>MX THEN I2(K)=MX
JD 6900 W2(K)=W2(T)+D:IF W2(K)
      >MX THEN W2(K)=MX
QD 6910 IF N4=0 THEN A(K)=0:W(
      K)=0:P(K)=0:Q(K)=0:GOT
      O6950
JF 6920 IF K>Y THEN CF(K)=CF(T
      )
PX 6930 A(K)=(I2(K)*P(K)/N)/(1
      -1/(I2(K)/N+1)↑N4)
BA 6940 W(K)=(W2(K)*Q(K)/N)/(1
      -1/(W2(K)/N+1)↑N4)
QG 6950 RETURN
MM 7000 REM--
SK 7010 DATA "LIFE INSURANCE N
      EEDS",0," ",0
DF 7020 DATA "TOTAL HOUSEHOLD
      {SPACE}SALARY INCOME",
      2,43000
BF 7030 DATA "YOUR SALARY, BEF
      ORE TAXES",2,25000
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MQ 7040 DATA "ANNUAL SAVINGS",
        2,2000
CD 7050 DATA "YOUR AGE",4,42,0
        ,99
EA 7060 DATA "# OF PEOPLE IN H
        OUSEHOLD",4,4,0,10
XX 7070 DATA "AGE OF YOUNGEST
        {SPACE}PERSON",4,6,0,9
        9
AB 7080 DATA " ",0
JR 7090 DATA "CASH, SAVINGS/CH
        ECKING ACCT.",2,1200
EE 7100 DATA "STOCKS, MUTUAL F
        UNDS",2,5000
MR 7110 DATA "HARD ASSET INVES
        TMENTS",2,0
QQ 7120 DATA " ",0,"HOME MORTG
        AGE",2,50000
KC 7130 DATA "CAR LOAN",2,5000
BM 7140 DATA "CONSUMER DEBT",2
        ,500
DP 7150 DATA "COLLEGE FUND",2,
        65000
EQ 7160 DATA "CHARITABLE CONTR
        IBUTIONS",2,1000
FD 7170 DATA "CURRENT INTEREST
         RATE",1,9.35,0
XJ 7180 DATA E
RS 7190 ZT=7000:LC=38:GOSUB155
        0:IF Q2>0 THEN FV(16)=
        Q2
JX 7200 PRINTCD$:SF=0
BG 7210 GOSUB580
CS 7220 GOSUB1840
DF 7230 GOSUB780
SR 7240 ON QA GOTO400,7250,723
        0
FX 7250 IF FV(2)<FV(3) THEN PR
        INTFC$(2)" LESS
        {SHIFT-SPACE}THAN":PRI
        NTFC$(3);ER$:GOTO7520
HC 7260 FE=.6*FV(3):IF FE<6000
         THEN FE=6000
XD 7270 CA=FV(9)+FV(10)*.9+FV(
        11)*.8:CD=FV(13)+FV(14
        )+FV(15)+FV(16)
JG 7280 IF FV(6)<2 THEN AN=FE-
        CA+CD:GOTO7400
BM 7290 RE=FV(3)-FV(2)/(FV(6)+
        .5)-FV(4)*FV(3)/FV(2):
        I=FV(18)+1:IF I<2.5 TH
        EN I=2.5
XS 7300 R2=RE*2:IF FV(3)<4000
        {SPACE}OR FV(5)<25 OR
        {SPACE}FV(6)<2 OR FV(7
        )>18 THEN7330
RM 7310 T4=FV(3):IF T4>37000 T
        HEN T4=37000
AE 7320 RE=RE-4000-(FV(6)>3)*1
        400-T4/15
KG 7330 IP=RE/I*100+R2:IF IP<0
         THEN IP=0:GOTO7360
KX 7340 IF FV(7)<10 THEN IP=IP
        *(1+(10-FV(7))/33)
EQ 7350 IF FV(7)>12 AND FV(7)<
        21 THEN IP=IP*(1-(FV(7
        )-12)/33)
XJ 7360 T=FV(3)/(FV(2)+1)
MP 7370 AN=IP+FE-CA*T+CD*SQR(T
        )+FV(17):IF FV(6)>2AND
         IP<1THEN AN=AN+(FV(6)
        -2)*2500
HD 7380 IF AN>100000 THEN AN=F
        N R2(5000):GOTO7410
HX 7390 IF AN>50000 THEN AN=FN
         R2(2500):GOTO7410
EF 7400 AN=FN R2(1000)
JQ 7410 PRINTSP$:PRINTSP$:PRIN
        TU3$
CJ 7420 IF AN<1000 THEN PRINT"
        YOU MAY NOT NEED ANY L
        IFE INSURANCE.":GOTO75
        20
EP 7430 PRINT"YOU SHOULD HAVE
        {SPACE}ABOUT $";STR$(A
        N)
ES 7440 PRINT"IN LIFE INSURANC
        E COVERAGE.{2 SPACES}L
        OOK INTO"
EG 7450 T$="UNIVERSAL LIFE":A=
        FV(5):T=AN/FV(2)
EX 7460 IF T>10 OR (T>8 AND AN
        >30) OR (T>6 AND A>35)
         THEN T$="TERM LIFE":G
        OTO7490
BG 7470 T=FV(2)/FV(4):IF T<5 O
        R (T<6 AND A<35) THEN
        {SPACE}T$="TERM LIFE":
        GOTO7490
PR 7480 IF A<35 OR (A<55 AND F
        V(4)<1000) THEN T$="TE
        RM LIFE OR UNIVERSAL L
        IFE"
SA 7490 IF FV(3)>75000 AND FV(
        4)<FV(2)/50 AND CA<FV(
        3) THEN T$="WHOLE LIFE
        "
AX 7500 IF FV(4)<FV(2)/25 AND
        {SPACE}FV(5)>45 AND CA
        <FV(2) THEN T$="WHOLE
        {SPACE}LIFE"
PC 7510 PRINT"A "T$" POLICY."H
        $
RB 7520 GOSUB1860:ON RA GOTO40
        0,7200
AP 7530 GOSUB600:GOTO7520
BF 8000 REM--
RE 8010 DATA "REFINANCING A MO
        RTGAGE",0," ",0
CD 8020 DATA "CURRENT FINANCIN
        G",0
DX 8030 DATA " CURRENT BALANCE
        ",2,65000
AJ 8040 DATA " ANNUAL % RATE",
        1,12.5,1
MF 8050 DATA " # PAYMENTS DUE"
        ,4,300,1,480
KF 8060 DATA " ",0,"SUGGESTED
        {SPACE}REFINANCING",0
HM 8070 DATA " PRINCIPAL",2,65
        000
DD 8080 DATA " ANNUAL % RATE",
        1,10.86,1
HE 8090 DATA " # PAYMENTS",4,3
        60,1,600
KX 8100 DATA " POINTS",1,3,0
HX 8110 DATA " OTHER CLOSING C
        OSTS",2,2500
XP 8120 DATA " PREPAYMENT PENA
        LTY",2,0
KR 8130 DATA "TAX BRACKET",1,2
        8,0
QA 8140 DATA "INTEREST AND POI
        NTS DEDUCTIBLE",3,1
QS 8150 DATA IR
QF 8160 DATA E
GG 8170 ZT=8000:LC=37:GOSUB155
        0
QX 8180 PRINTCD$:SF=0:GOSUB580
EJ 8190 GOSUB1840
RA 8200 GOSUB780
CE 8210 ON QA GOTO400,8220,820
        0
BG 8220 P=FV(3):Q=FV(8):I2=FV(
        4)/100:W2=FV(9)/100:D=
        1-FV(15)*FV(14)/10000
JQ 8230 NY=FV(5):N4=FV(10):PS=
        P:N=12
XH 8240 PT=(FV(11)*D-FV(11))/N
        4
RM 8250 CF=0:CW=FV(13)+FV(12)+
        FV(11)
DE 8260 TY=NY:IF TY<N4 THEN TY
        =N4
GA 8270 A=(I2*P/N)/(1-1/(I2/N+
        1)↑NY):AV=A*D
GM 8280 RI=(1+I2)↑(1/N):R2=(1+
        W2)↑(1/N):R4=(1+FV(16)
        /100)↑(1/N)
SG 8290 W=(W2*Q/N)/(1-1/(W2/N+
        1)↑N4):WV=W*D+PT:AN=0
HK 8300 FOR K=1 TO TY
QS 8310 P=P*RI-A:Q=Q*R2-W:RK=R
        4↑K
FG 8320 CF=CF+AV/RK:CW=CW+WV/R
        K
HB 8330 TP=CF-(PS-P)/RK:TQ=CW-
        (PS-Q)/RK
BK 8340 IF TQ<TP AND AN=0 THEN
         AN=K
EG 8350 IF K/12=INT(K/12) THEN
         T=K/12:P(T)=TP:Q(T)=T
        Q
SX 8360 NEXT
HQ 8370 PRINT"THE PAYMENTS ON
        {SPACE}REFINANCING WIL
        L BE"
HC 8380 IF ABS(A-W)<.5 THEN PR
        INT"ABOUT THE SAME AS
        {SPACE}THE OLD PAYMENT
        S.":GOTO8420
DJ 8390 IF A>W THEN RR=A-W:GOS
        UB1670:PRINT" LESS THA
        N THE OLD PAYMENTS."
BJ 8400 IF A<W THEN RR=W-A:GOS
        UB1670:PRINT" MORE THA
        N THE OLD PAYMENTS."
MA 8410 IF AN>0 THEN8440
QC 8420 PRINT"REFINANCING WITH
         THESE TERMS COSTS YOU
        "
AA 8430 PRINT"MONEY, SO YOU PR
        OBABLY SHOULDN'T DO IT
        .":GOTO8470
GE 8440 AN=AN/12:PRINT"YOU MUS
        T WAIT "FN R2(.1)"YEAR
        S FOR"
FA 8450 PRINT"THE REFINANCING
        {SPACE}TO BE BETTER TH
        AN THE"
CE 8460 PRINT"EXISTING MORTGAG
        E."H$
BR 8470 GOSUB1860:ON RA GOTO40
        0,8180
GF 8480 GOSUB600:GOTO8470
QE 9000 REM--
XB 9010 DATA "IRA PLANNER",0,"
         ",0
PE 9020 DATA "YOUR AGE",4,42,0
        ,65
JG 9030 DATA "CURRENT IRA
        {SHIFT-SPACE}BALANCE",
        2,7100
CE 9040 DATA "THIS YEAR'S CONT
        RIBUTION",2,2000
DK 9050 DATA "ESTIMATED ANNUAL
         YIELD",1,9.23,0
HB 9060 DATA "CURRENT TAX BRAC
        KET",1,28,0
XX 9070 DATA "EARLY WITHDRAWAL
         PENALTY",1,10,0
MS 9080 DATA "% OF CONTRIBUTIO
        N DEDUCTIBLE",1,100,0
PF 9090 DATA "RETIREMENT AGE",
        4,67,0,70
RS 9100 DATA "TAX BRACKET WHEN
         YOU WITHDRAW",1,33,0
AM 9110 DATA IR,E
CQ 9120 ZT=9000:LC=36:GOSUB155
        0
HA 9130 PRINTCD$:SF=0
HR 9140 GOSUB580
XF 9150 GOSUB1840
JD 9160 GOSUB780
XK 9170 ON QA GOTO400,9180,916
        0
XS 9180 IF FV(9)<=FV(2) THEN P
        RINTFC$(2)" GREATER
        {SHIFT-SPACE}THAN "FC$
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        (9):PRINTER$:GOTO9420
PE 9190 Y=FV(9)-FV(2):RI=1+FV(
        5)*(100-FV(6))/10000
QD 9200 R2=(100-FV(6))/100:R3=
        (100-FV(10))/100:I=1+F
        V(5)/100
JX 9210 I2=FV(4)*I↑Y-FV(4):DR=
        FV(8)/100:ND=FV(4)-FV(
        4)*DR:DD=FV(4)*DR
HG 9220 AN=I2*R3+DD*R3-ND*R2*R
        I↑Y+ND:T3=FV(4)*R2:A2=
        RI↑Y*T3
CC 9230 PRINT"CONTRIBUTION WIL
        L BE WORTH $"INT(AN+.5
        )
XJ 9240 PRINT"(AFTER TAXES) WH
        EN YOU RETIRE."
KE 9250 PRINT"COMPARED TO $"IN
        T(A2+.5)"OUTSIDE THE I
        RA.":T=(100-FV(7))/100
FR 9260 PRINTR$"STILL CALCULAT
        ING"
EG 9270 T6=FV(3)*I↑Y*R3
        {25 SPACES}
AM 9280 T3=FV(4)*R2:AN=0
MD 9290 FOR K=1 TO Y
FE 9300 T4=(FV(4)*I↑K-FV(4))*R
        3+DD*R3-ND*R2*RI↑K+ND
KB 9310 T6=T6+T4:IF K+FV(2)>59
         THEN T=1
BG 9320 T8=T4-ND:T8=T8*T:T8=T8
        +ND
HS 9330 T5=T3*RI↑K:IF T8>T5 AN
        D AN=0 THEN AN=K:T7=T4
RJ 9340 NEXT
JJ 9350 PRINTU$"IF YOU CONTRIB
        UTE THIS AMOUNT EVERY"
EF 9360 PRINT"YEAR YOU WILL HA
        VE{SHIFT-SPACE}$"INT(T
        6)"WHEN YOU"
SK 9370 PRINT"RETIRE (AFTER PA
        YING TAXES).{2 SPACES}
        THIS WILL"
JM 9380 PRINT"BE WORTH $"INT(T
        6/(1+FV(11)/100)↑Y)"AF
        TER INFLATION."
QJ 9390 IF AN=0 THEN PRINT"AN
        {SPACE}IRA
        {SHIFT-SPACE}MAY NOT B
        E RIGHT FOR YOU.":GOTO
        9420
AJ 9400 PRINT"IT WILL TAKE"AN"
        YEARS BEFORE EARLY"
EK 9410 PRINT"WITHDRAWALS ARE
        {SPACE}PROFITABLE."
AS 9420 GOSUB1860:ON RA GOTO40
        0,9130
XD 9430 GOSUB600:GOTO9420
```

The GEOS Column

See instructions in article on page 56 before typing in.

Program 1: File Retriever

```
1503:BF 00 C0 00 03 20 00 04 C1
150B:F0 00 08 08 00 16 44 00 10
1513:25 C2 00 22 61 00 5A 3A 9C
151B:80 47 17 40 31 91 A0 18 67
1523:E8 10 08 98 F0 04 47 F0 67
152B:02 C3 20 01 66 90 00 BE 8F
1533:58 00 4C 98 00 3F 44 00 22
153B:1C A8 00 00 DC 00 00 28 AC
1543:83 06 00 00 04 FF 03 00 D6
154B:04 46 69 6C 65 20 52 65 B2
1553:74 72 69 65 76 65 72 20 26
155B:56 32 2E 30 00 4A 6F 68 76
1563:6E 20 46 2E 20 48 6F 77 F0
156B:61 72 64 00 00 00 00 00 6F
1573:00 00 00 00 00 00 00 00 9D
157B:00 00 00 00 00 00 00 00 A5
1583:00 00 00 00 00 00 00 00 AD
158B:00 00 00 00 00 00 00 00 B5
1593:00 00 00 00 00 00 00 00 BD
159B:00 00 00 00 53 75 70 70 87
15A3:6F 72 74 73 20 31 35 34 4C
15AB:31 2C 20 31 35 37 31 20 99
15B3:26 20 31 35 38 31 20 64 9D
15BB:72 69 76 65 73 20 61 6E EB
15C3:64 20 62 72 69 6E 67 73 E2
15CB:20 62 61 63 6B 20 43 3D A0
15D3:20 6F 72 20 67 65 6F 73 5D
15DB:20 66 69 6C 65 73 00 00 9C
15E3:00 00 00 00 00 00 00 00 0E
15EB:00 00 00 00 00 00 00 00 16
15F3:00 00 00 00 00 00 00 00 1E
15FB:00 00 00 00 20 B1 06 A9 A3
1603:0C 85 03 A9 3C 85 02 20 AD
160B:5A C1 A9 0C 85 03 A9 48 9E
1613:85 02 A9 00 20 51 C1 60 E1
161B:20 BD C1 A9 09 85 03 A9 A7
1623:82 85 02 20 56 C2 60 4C FE
162B:2C C2 20 BD C1 A9 00 85 38
1633:7C 4C 6A 04 20 BD C1 A9 63
163B:01 85 7C 4C 6A 04 A9 0B 5F
1643:8D 1D 85 4C BF C2 A9 0C 5B
164B:8D 1D 85 4C BF C2 A9 0D 64
1653:8D 1D 85 4C BF C2 A9 0E 6D
165B:8D 1D 85 4C BF C2 A9 0F 76
1663:8D 1D 85 4C BF C2 A9 01 70
166B:85 7D A9 12 85 70 A9 01 52
1673:85 71 A9 02 85 77 A9 00 71
167B:85 7A 85 79 85 7E AD C6 99
1683:88 29 3F C9 01 F0 27 C9 A6
168B:02 F0 1F C9 03 D0 0F A9 98
1693:03 85 7D A9 28 85 70 A9 CE
169B:03 85 71 B8 50 10 A9 0A 84
16A3:85 03 A9 F4 85 02 20 56 A2
16AB:C2 60 A9 02 85 7D 20 40 49
16B3:07 20 5B 07 A5 02 C9 03 13
16BB:D0 03 4C E1 04 C9 06 D0 DC
16C3:11 A9 0A 85 03 A9 4F 85 5F
16CB:02 20 56 C2 20 A1 C2 4C 51
16D3:6A 04 C9 0B D0 06 20 94 93
16DB:07 4C 6A 04 60 A5 70 85 2C
16E3:04 A5 71 85 05 A9 80 85 57
16EB:0B A9 00 85 0A 20 E4 C1 BC
16F3:A9 00 85 78 AD 00 80 85 21
16FB:72 AD 01 80 85 73 A6 77 B3
1703:BD 00 80 D0 03 20 8F 05 E9
170B:A5 77 C9 E2 F0 08 18 69 92
1713:20 85 77 4C 02 05 A5 78 4E
171B:F0 13 A5 70 85 04 A5 71 3B
1723:85 05 A9 80 85 0B A9 00 3E
172B:85 0A 20 E7 C1 A5 72 F0 9B
1733:0D 85 70 A5 73 85 71 A9 EF
173B:02 85 77 4C E1 04 AD 8B 85
1743:84 F0 19 A5 7A D0 15 AD 5C
174B:AB 82 85 70 AD AC 82 85 52
1753:71 A9 02 85 77 A9 01 85 27
175B:7A 4C E1 04 A5 79 F0 1F 6A
1763:20 4A C2 A9 0A 85 03 A9 3D
176B:D0 85 02 20 56 C2 A5 7E 2D
1773:D0 01 60 A9 0B 85 03 A9 0F
177B:12 85 02 20 56 C2 60 A9 7E
1783:0A 85 03 A9 9F 85 02 20 4A
178B:56 C2 60 A5 77 18 69 03 ED
1793:AA BD 00 80 D0 01 60 A5 7F
179B:7C D0 0E A5 77 18 69 16 5D
17A3:AA BD 00 80 C9 0D D0 01 C3
17AB:60 A5 77 18 69 13 A8 B9 86
17B3:00 80 C9 00 D0 03 4C 06 6C
17BB:06 85 04 85 74 C8 B9 00 61
17C3:80 85 05 85 75 A9 81 85 67
17CB:0B A9 00 85 0A 20 E4 C1 9E
17D3:AD 00 81 C9 00 F0 03 4C BB
17DB:06 06 AD 01 81 C9 FF F0 78
17E3:03 4C 06 06 AD 02 81 C9 0A
17EB:03 F0 03 4C 06 06 AD 03 A3
17F3:81 C9 15 F0 03 4C 06 06 62
17FB:AD 44 81 85 76 A5 7C F0 CE
1803:06 60 A5 7C D0 01 60 A0 B6
180B:00 A5 77 18 69 03 AA BD 7F
1813:00 80 99 40 7F E8 C8 C0 8C
181B:10 D0 F4 A9 00 99 40 7F 27
1823:AD 8B 84 F0 09 A5 7A C9 4A
182B:00 F0 03 4C 9A 06 A9 0A 07
1833:85 03 A9 77 85 02 20 56 5E
183B:C2 A5 02 C9 03 F0 01 60 51
1843:A5 7C F0 3D A9 0B 85 03 DE
184B:A9 52 85 02 20 56 C2 A5 3B
1853:02 C9 02 D0 03 4C 32 06 F7
185B:C9 0C D0 07 A9 82 85 76 D6
1863:4C 85 06 C9 0D D0 07 A9 DB
186B:81 85 76 4C 85 06 C9 0E 37
1873:D0 0B A9 84 85 76 A9 01 A6
187B:85 7E 4C 85 06 A9 83 85 53
1883:76 A6 77 A5 76 9D 00 80 8C
188B:A9 01 85 79 85 78 A5 7E F0
1893:D0 03 20 A9 07 60 A6 77 0A
189B:E8 BD 00 80 85 0E E8 BD AB
18A3:00 80 85 0F 20 AD C2 D0 A3
18AB:01 60 4C 32 06 A9 02 20 1C
18B3:39 C1 20 9F C1 00 C7 00 8C
18BB:00 3F 01 A9 00 20 39 C1 2B
18C3:20 9F C1 96 BE 3D 00 03 7B
18CB:01 20 A2 C1 96 BE 3D 00 1F
18D3:03 01 FF 20 AE C1 72 00 29
18DB:A0 18 2D 20 46 69 6C 65 20
18E3:20 52 65 74 72 69 65 76 27
18EB:65 72 20 2D 1B 00 20 AE 0A
18F3:C1 43 00 AE 43 6F 70 79 F2
18FB:72 69 67 68 74 20 31 39 F2
1903:38 39 2C 20 43 4F 4D 50 69
190B:55 54 45 21 20 50 75 62 47
1913:6C 69 63 61 74 69 6F 6E EE
191B:73 2C 20 49 6E 63 2E 00 08
1923:20 AE C1 78 00 BA 41 6C AA
192B:6C 20 52 69 67 68 74 73 B5
1933:20 52 65 73 65 72 76 65 35
193B:64 2E 00 60 A2 02 20 98 27
1943:C2 A0 00 B1 02 C9 A0 F0 83
194B:08 99 51 7F C8 C0 10 D0 44
1953:F2 A9 00 99 51 7F 60 AD F9
195B:8D 84 C9 02 F0 0B A9 09 DE
1963:85 03 A9 47 85 02 4C 90 20
196B:07 AD 89 84 38 E9 08 AA 2A
1973:BD 8E 84 29 80 D0 08 A9 4C
197B:06 8D 43 09 4C 88 07 A9 49
1983:00 8D 43 09 A9 09 85 03 91
198B:A9 28 85 02 20 56 C2 60 AD
1993:AD 89 84 C9 08 F0 05 A9 E3
199B:08 4C A2 07 A9 09 20 B0 0C
19A3:C2 20 A1 C2 60 A5 77 18 40
19AB:69 15 A8 B9 00 80 C9 01 1F
19B3:F0 2B A4 77 C8 B9 00 80 E2
19BB:85 04 C8 B9 00 80 85 05 78
19C3:20 4A 08 A9 10 85 0B A9 8A
19CB:00 85 0A 20 E4 C1 AD 00 2C
19D3:10 F0 63 85 04 AD 01 10 F7
19DB:85 05 B8 50 E3 A4 77 C8 97
19E3:B9 00 80 85 04 C8 B9 00 12
19EB:80 85 05 20 4A 08 A9 11 39
19F3:85 0B A9 00 85 0A 20 E4 5A
19FB:C1 A9 00 85 7B A5 7B 18 53
1A03:69 02 D0 03 4C 3A 08 85 97
1A0B:7B AA BD 00 11 F0 EE 85 0F
1A13:04 E8 BD 00 11 85 05 20 04
1A1B:4A 08 A9 10 85 0B A9 00 58
1A23:85 0A 20 E4 C1 AD 00 10 C3
1A2B:C9 00 F0 D1 85 04 AD 01 18
1A33:10 85 05 B8 50 E1 A5 7C CE
1A3B:D0 0B A5 75 85 05 A5 74 A6
1A43:85 04 20 4A 08 60 A9 82 7B
1A4B:85 21 A9 00 85 20 A5 7D 35
1A53:C9 03 D0 39 A9 89 85 21 7A
1A5B:A9 00 85 20 A5 04 C9 28 10
1A63:90 0D 38 E9 28 AA A9 9C A4
1A6B:85 21 A9 80 85 20 8A 85 2F
1A73:1C A9 00 85 1D A9 00 85 8D
1A7B:1F A9 06 85 1E A2 1C A0 17
1A83:1E 20 60 C1 A5 1C 18 69 2E
1A8B:0A A8 B8 50 42 A5 7D C9 78
1A93:02 D0 37 A5 04 C9 23 90 5C
1A9B:31 18 69 B9 A8 20 0E 09 22
1AA3:A5 04 38 E9 24 AA A9 89 F9
1AAB:85 21 A9 00 85 20 8A 85 67
1AB3:1C A9 00 85 1D A9 00 85 CD
1ABB:1F A9 03 85 1E A2 1C A0 F6
1AC3:1E 20 60 C1 A4 1C 88 B8 96
```

```
1ACB:50 08 A5 04 0A 0A A8 20 09
1AD3:0E 09 A5 05 C9 08 B0 04 2A
1ADB:AA 4C 09 09 C9 10 B0 07 21
1AE3:38 E9 08 AA 4C 08 09 C9 B8
1AEB:18 B0 07 38 E9 10 AA 4C ED
1AF3:07 09 C9 20 B0 07 38 E9 25
1AFB:18 AA 4C 06 09 38 E9 20 ED
1B03:AA C8 C8 C8 C8 C8 20 16 26
1B0B:09 60 B1 20 38 E9 01 91 13
1B13:20 60 A9 01 E0 00 F0 05 A4
1B1B:0A CA 4C 18 09 49 FF 31 B2
1B23:20 91 20 60 81 0B 10 10 40
1B2B:61 09 0B 10 20 74 09 0B A6
1B33:10 30 51 7F 12 11 34 DE BB
1B3B:0B 03 11 08 02 11 4A 06 49
1B43:11 1E 00 81 0B 10 10 61 BB
1B4B:09 0B 10 20 74 09 0B 10 BA
1B53:30 51 7F 03 11 08 06 11 DB
1B5B:1E 02 11 4A 00 18 52 65 52
1B63:74 72 69 65 76 65 1B 20 93
1B6B:61 20 66 69 6C 65 20 00 F6
1B73:6F 6E 20 74 68 69 73 20 38
1B7B:64 69 73 6B 3F 00 01 20 7F
1B83:7F 1B 00 24 01 0B 18 1C 03
1B8B:9F 09 0B 18 2A CC 09 0B 58
1B93:18 38 F9 09 0B 18 46 29 22
1B9B:0A 0E 00 18 46 69 6C 65 F1
1BA3:20 52 65 74 72 69 65 76 EC
1BAB:65 72 1B 20 77 61 73 20 DE
1BB3:77 72 69 74 74 65 6E 20 EC
1BBB:66 6F 72 20 31 35 34 31 49
1BC3:2C 20 31 35 37 31 2C 00 68
1BCB:61 6E 64 20 31 35 38 31 DC
1BD3:20 64 72 69 76 65 73 20 68
1BDB:61 6E 64 2F 6F 72 20 61 C4
1BE3:6E 20 52 45 55 2E 20 49 E4
1BEB:74 20 77 6F 72 6B 73 20 92
1BF3:77 69 74 68 00 47 45 4F 4C
1BFB:53 20 31 2E 33 20 61 6E 38
1C03:64 20 32 2E 30 20 61 6E D1
1C0B:64 20 63 61 6E 20 72 65 3E
1C13:74 72 69 65 76 65 20 62 91
1C1B:6F 74 68 20 67 65 6F 73 5A
1C23:20 61 6E 64 00 6E 6F 6E DE
1C2B:2D 67 65 6F 73 20 66 69 C9
1C33:6C 65 73 20 66 72 6F 6D B4
1C3B:20 74 68 65 20 74 72 61 1D
1C43:73 68 20 62 61 73 6B 65 8E
1C4B:74 2E 00 81 0B 10 10 59 73
1C53:0A 01 11 48 00 18 49 6E D8
1C5B:73 65 72 74 20 6E 65 77 39
1C63:20 64 69 73 6B 20 69 6E 46
1C6B:74 6F 20 64 72 69 76 65 8F
1C73:2E 1B 00 81 0B 10 1C 89 FB
1C7B:0A 0B 10 2E 40 7F 04 11 79
1C83:48 03 01 48 00 18 52 65 AF
1C8B:74 72 69 65 76 65 1B 20 BD
1C93:74 68 69 73 20 66 69 6C 5E
1C9B:65 3F 00 81 0B 10 1C AC EB
1CA3:0A 0B 10 28 BB 0A 0E 00 4A
1CAB:45 6E 64 20 6F 66 20 73 79
1CB3:65 61 72 63 68 2E 00 4E C5
1CBB:6F 20 66 69 6C 65 73 20 17
1CC3:18 52 65 74 72 69 65 76 0B
1CCB:65 64 1B 00 81 0B 10 1C A7
1CD3:D8 0A 0E 00 18 46 69 6C D5
1CDB:65 20 52 65 74 72 69 65 15
1CE3:76 61 6C 1B 20 63 6F 6D C9
1CEB:70 6C 65 74 65 64 2E 00 84
1CF3:81 0B 10 22 FC 0A 0E 00 FF
1CFB:18 55 6E 6B 6E 6F 77 6E A8
1D03:20 64 72 69 76 65 20 74 49
1D0B:79 70 65 2E 1B 00 81 0B 94
1D13:10 1C 1F 0B 0B 10 28 34 0E
1D1B:0B 0E 00 18 56 61 6C 69 5A
1D23:64 61 74 65 1B 20 74 68 77
1D2B:69 73 20 64 69 73 6B 00 31
1D33:66 72 6F 6D 20 74 68 65 0B
1D3B:20 44 65 73 6B 54 6F 70 76
1D43:20 18 64 69 73 6B 1B 20 56
1D4B:6D 65 6E 75 2E 00 81 0B 3A
1D53:10 1C 89 0B 0B 67 1C 40 EC
1D5B:7F 0B 1C 35 9F 0B 0B 44 72
1D63:35 A5 0B 0B 6C 35 AB 0B 4E
1D6B:0B 94 35 B1 0B 12 02 2E E4
1D73:B7 0B 12 07 2E BF 0B 12 97
1D7B:0C 2E C7 0B 12 11 2E CF F1
1D83:0B 02 11 48 00 53 65 6C EE
1D8B:65 63 74 20 66 69 6C 65 F8
1D93:20 74 79 70 65 20 66 6F 19
1D9B:72 20 00 18 50 52 47 1B 0E
1DA3:00 18 53 45 51 1B 00 18 B1
1DAB:52 45 4C 1B 00 18 55 53 F9
1DB3:52 1B 00 D7 0B 00 00 01 B4
1DBB:08 4A 04 D7 0B 00 00 01 E3
1DC3:08 52 04 D7 0B 00 00 01 ED
1DCB:08 5A 04 D7 0B 00 00 01 F7
1DD3:08 62 04 81 FF 06 81 82 E0
1DDB:FF BF E6 0B 00 00 06 10 AF
1DE3:42 04 05 FF 82 FE 80 04 F5
1DEB:00 82 03 80 04 00 B8 03 C3
1DF3:80 FC 01 80 00 03 80 C6 A9
1DFB:00 00 00 03 80 C3 3D B3 A7
1E03:3C 03 80 C3 39 B3 66 03 D2
1E0B:80 C3 31 B3 66 03 80 C3 DD
1E13:31 9E 7E 03 80 C3 31 9E A3
1E1B:60 03 80 C6 31 8C 66 03 50
1E23:80 FC 31 8C 3C 03 80 04 C0
1E2B:00 82 03 80 04 00 81 03 96
1E33:06 FF 81 7F 05 FF 0C BF 9A
1E3B:01 00 00 00 00 00 00 00 F7
1E43:01 01 00 00 00 0E 00 00 78
1E4B:3C 00 02 59 0C 80 67 0C B8
1E53:5E 0C 80 82 0C 66 69 6C 33
1E5B:65 00 72 65 74 72 69 65 94
1E63:76 65 00 0E 2A 00 00 18 7E
1E6B:00 82 78 0C 00 1C 04 7D 0E
1E73:0C 00 2B 04 69 6E 66 6F 9C
1E7B:00 71 75 69 74 00 0E 2A 43
1E83:14 00 5B 00 82 93 0C 00 AF
1E8B:2E 04 9E 0C 00 38 04 67 C4
1E93:65 6F 73 20 66 69 6C 65 E5
1E9B:73 00 6E 6F 6E 2D 67 65 B2
1EA3:6F 73 20 66 69 6C 65 73 1A
1EAB:00 00 00 00 00 00 00 00 E7
```

Program 2: GeoConverter

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
XG 20 REM THIS IS THE UPDATED
      {SPACE}GEOCONVERTER
      {8 SPACES}REVISED MAY IS
      SUE 1988 GAZETTE
AC 30 POKE 53280,0:POKE 53281,
      0:POKE 646,5:PRINTCHR$(1
      42);CHR$(147)
PS 40 FORI=1TO10:PRINT"{DOWN}"
      :NEXT
ER 50 PRINTTAB(5)"{4}UDI COPYR
      IGHT 1989"
SP 60 PRINTTAB(5)"GCH COMPUTE!
       PUBLICATIONS INC."
SP 70 PRINTTAB(5)"JFK ALL RIGH
      TS RESERVED{HOME}"
EP 80 PRINT"{DOWN}{RVS}{8}GEOC
      ONVERTER 1.1{OFF}{DOWN}
      {GRN}"
AP 90 INPUT"FILE TO CONVERT";G
      F$
CX 100 PRINT"{DOWN}SEARCHING F
       OR "GF$
PA 110 HD$="":FOR I=1 TO 4:REA
       D HE:HD$=HD$+CHR$(HE):N
       EXT
FK 120 FOR I=1TO5:READIE:ID$=I
       D$+CHR$(IE):NEXT
GD 130 NL$="":T$=CHR$(18):S$=C
       HR$(1):OPEN 15,8,15,"I0
       :":OPEN 2,8,2,"#"
JX 140 GOSUB370:GET #2,NT$,NS$
KB 150 FOR E=0 TO 7
KQ 160 D$=NL$:GET#2,B$:I=1:IFB
       $=NL$ THEN220
AX 170 IF ASC(B$)<>130 THEN220
HM 180 GET#2,HT$,HS$:I=3:IF HS
       $="" THEN HS$=CHR$(0)
FH 190 GET#2,B$:I=I+1:IF B$=""
       THEN B$=CHR$(0)
FA 200 IF ASC(B$)=160 THEN220
GD 210 D$=D$+B$:GOTO190
RK 220 FOR I=I TO 31:GET#2,B$:
       NEXT
AX 230 IF D$=GF$ THEN260
EC 240 NEXT E:IF NT$=NL$ THEN2
       60
FX 250 T$=NT$:S$=NS$:GOTO140
CR 260 IF D$=NL$ THENPRINT"
       {DOWN}{RVS}FILE NOT FOU
       ND{OFF}":GOTO360
CP 270 PRINT"{DOWN}CONVERTING
       {SPACE}"GF$
MJ 280 DT$=T$:DS$=S$:T$=HT$:S$
       =HS$:GOSUB370
MB 290 GET#2,MT$,MS$:IF MS$=""
        THEN MS$=CHR$(0)
BM 300 FOR I=0 TO 65:GET #2,B$
       :NEXT
HG 310 GET#2,CT$,GT$:GOSUB370:
       PRINT#2,HD$;:GOSUB380:T
       $=DT$:S$=DS$:GOSUB370
FP 320 FOR I=0 TO 32*E+2:GET#2
       ,B$:NEXT
FQ 330 PRINT#2,MT$;MS$;:FORI=0
        TO 15:GET#2,B$:NEXT
GP 340 PRINT#2,HT$;HS$;CHR$(0)
       ;GT$;
KM 350 PRINT#2,ID$;:GOSUB380:P
       RINT:PRINTGF$" CONVERTE
       D"
ER 360 CLOSE2:CLOSE15:END
KA 370 U$="U1":GOTO390
RR 380 U$="U2"
KP 390 PRINT#15,U$;2;0;ASC(T$+
       "0");ASC(S$+"0")
AS 400 RETURN
FM 410 DATA 0,255,3,21,87,10,1
       ,0,0
```


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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the *Gazette*, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it. **G**

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL 9	
{OFF}	CTRL 0	
{BLK}	CTRL 1	
{WHT}	CTRL 2	
{RED}	CTRL 3	
{CYN}	CTRL 4	

When You Read:	Press:	See:
{PUR}	CTRL 5	
{GRN}	CTRL 6	
{BLU}	CTRL 7	
{YEL}	CTRL 8	
{ F1 }	f1	
{ F2 }	SHIFT f1	
{ F3 }	f3	
{ F4 }	SHIFT f3	
{ F5 }	f5	
{ F6 }	SHIFT f5	
{ F7 }	f7	
{ F8 }	SHIFT f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT ↑	

For Commodore 64 Only

[1]	COMMODORE 1	
[2]	COMMODORE 2	
[3]	COMMODORE 3	
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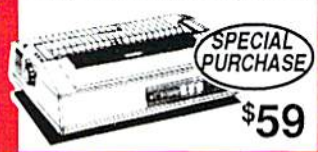

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